WHOLESALER'S SALESMAN

CONTENTS — SEPTEMBER, 1943

Times and Trends ..... O. Fred. Rost 11
Business Index—Sales and Inventories 19
Business Index—Regional Analysis 22

4th NATIONAL LIGHTING SHOW IN PRINT

Let's Get Going! ..... An editorial by O. Fred. Rost 40
When Does It Pay To Install Fluorescent Lighting? ..... John Neidhart 42
Through Steady Promotion of Good Lighting This Wholesaler Offsets Lost Sales Volume ..... Frank Elliott, Jr. 46
Selling Infra-red . . . Under Present Conditions ..... Williard S. Crandall 48
Model War-time Lighting Sets Lighting's Peacetime Standards 50
Where the Wholesalers Fit In Future Selling of Lighting Equipment ..... E. D. Stryker 54
What Will Be The Trends In Selling Lighting Equipment? ..... A Symposium 59
Key to the Future of Lighting Is the History of Its Past ..... Dr. Woldemar A. Weyl 72

Recent WPB Orders and Revisions 96
A Primer of Electronics ..... Don. P. Caverly 99
News Notes from N.E.W.A. ..... Alfred Byers 113
Aviation—A Progress Report ..... An Editorial by James H. McGraw, Jr. 114
Wholesaler's Salesman News ..... 33 and 120

TESTED READERSHIP — A McGRAW-HILL PUBLICATION

O. FRED. ROST
Editor and Manager

HOWARD J. EMERSON
Managing Editor

A. XIQUES
Assistant Editor

W. A. CYR
Pacific Coast Editor

H. W. YOUNG
North Western Editor

HARRY PHILLIPS
Art Editor

DISTRICT MANAGERS

WM. B. HEAPS
CHARLES F. MINOR, JR.
Chicago

FRANK J. SEILER
Cleveland

ROY PHELAN
Los Angeles

J. H. ALLEN, JR.
In the U. S. Navy

A. B. CONKLIN, JR.
In the U. S. Army

McGRAW-HILL PUBLISHING COMPANY, INC.
Publication Office, 99-129 North Broadway, Albany 1, N. Y.
EDITORIAL AND EXECUTIVE OFFICES, 330 WEST 42 ST., NEW YORK 18, N. Y.
JAMES H. McGRAW, *Founder and Honorary Chairman*
JAMES H. McGRAW, JR., *President*; HOWARD EHRLICH, *Executive Vice-President*; MASON BRITTON, *Vice-President*; CURTIS W. McGRAW, *Treasurer*; JOSEPH A. GERARDI, *Secretary*; J. E. BLACKBURN, JR., *Director of Circulation*

WHOLESALER'S SALESMAN (formerly Electrical Wholesaling) September, 1943, (Vol. 24, No. 9). Published monthly, price 25c a copy. **Return postage guaranteed.** Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, Wholesaler's Salesman, 330 West 42nd Street, New York 18, N. Y. Subscription rates—United States, U. S. Possessions and Latin American Republics, $1.00 for one year, $1.50 for two years, $2.00 for three years. Canada, $1.50 for one year, $2.50 for two years, $3.00 for three years. All other countries, $2.00 or 12 shillings for one year, $3.00 or 18 shillings for two years, $4.00 or 24 shillings for three years. Entered as Second Class Matter, August 22, 1936, at Post Office, Albany, N. Y., under the Act of March 3, 1879. Cable Address: "McGraw-Hill, New York." Member of A.B.P. Member of A.B.C.

Copyright, 1943, by McGraw-Hill Publishing Co., 330 West 42nd Street, New York 18, N. Y.

BRANCH OFFICES: 520 North Michigan Ave., Chicago 11; 68 Post Street, San Francisco 4; 601 W. Fifth St., Los Angeles 13; Aldwych House, Aldwych, London, W.C. 2; Washington 4; Philadelphia 2; Cleveland 15; Detroit 2; St. Louis 8; Boston 16; Atlanta 3, Ga.

CHANGE OF ADDRESS

McGRAW-HILL PUBLISHING COMPANY
330 West 42nd Street, New York 18, N. Y.

Director of Circulation:
Please change my address on WHOLESALER'S SALESMAN

From .....

.....

To .....

.....

Signed .....

GREAT NAMES in American Progress

ROBERT FULTON, BOAT BUILDER — On a fateful Friday in 1807, a skeptical crowd gathered at the foot of Cortlandt Street, New York. They came to watch "Fulton's Folly" attempt the "impossible" by traveling without sails from New York to Albany. Those who came to jeer stayed to cheer. "Crazy" Bob's puffing, snorting Clermont wheezed away from the jetty and grunted upstream against the wind at the miraculous speed of four miles an hour. On that day, Robert Fulton, well-nigh penniless dreamer, revolutionized the water-borne transportation of the world.

AMERICAN BLOWER

American Blower products have contributed much towards the progress of American industry – progress that today is making it possible for America's vital industries to outproduce the world. In the great public utilities, the steel industry, in the manufacture of petroleum products, chemicals, in food processing, mining, smelting and refining, in hospitals, schools, public buildings and homes, American Blower air handling equipment has kept pace with progress.

Utility Set

CONTRACTORS—DEALERS— We're working 100% for victory. But you can still buy American Blower products for vital war work. After victory we'll be ready with the most complete line of heating, ventilating and air handling equipment in history.

ARMY E NAVY
For excellence in production

AMERICAN BLOWER CORPORATION, DETROIT, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of AMERICAN Radiator and Standard Sanitary Corporation

TIMES and TRENDS

Transition and Re-conversion We have warned frequently that the post-war period, the time of re-conversion, will not just begin suddenly when the fighting stops but will get under way progressively in different fields at different times. This despite the fact that in many industries war production will absorb 100 percent of capacity for some time to come, because our total output of war goods is not expected to reach its all-time peak until late this Fall.

However recent reports indicate that in some fields the process of transition toward postwar—from 100 percent war production toward more civilian production—is getting under way. Some ordnance plants already have been shut down for duration. A more liberal chunk of steel tonnage has been allocated to production of farm machinery, railroad equipment, to supply civilian needs for repair parts of automobiles, washing machines, etc. Certain textile mills have received easements on delivery dates for military goods and as the direct result will be able to step up production of civilian goods—a very significant fact because the first instances of entire plants being forced into 100 percent war production occurred in the textile field, and before Pearl Harbor.

Therefore, unless the armed forces of the Allied Nations should experience some serious set-backs, it is reasonable to expect that in hundreds of factories production of appliances and other goods for civilian consumption gradually will be resumed on a controlled scale in the first half of 1944—after war production all along the line has reached its peak stride.

Thus the period of transition, the beginning of re-conversion, is at hand and while the process necessarily will be slow, nevertheless it will generate millions of dollars of new sales volume for the wholesalers and manufacturers who are prepared to serve industry.

★

Store Fronts and Lighting From R. L. Clause, president of Pittsburgh Plate Glass Company, comes the estimate that 200,000 to 400,000 retailers will undertake modernization of their stores in the first year of peace. Mr. Clause figures that even if only 200,000 stores were modernized during that first peace-year, it would mean the expenditure of 90 to 100 million dollars.

At the same time Mr. Clause pointed out that the magazine *Chain Store Age,* after a survey of its field, says that chain stores will spend approximately 500 million dollars for store-modernization during the first post-war year.

Of course Mr. Clause is interested in these beckoning markets because his company makes materials for store fronts, BUT, what retailer would think of improving his store front and not at the same time plan for improving what's behind the front—the store itself and THAT MEANS MODERNIZING THE LIGHTING EQUIPMENT, in the show windows and in the store itself.

The lighting industry through aggressive selling by the manufacturers, the wholesalers, the contractors, the utilities, can capture a good slice of that huge market, if it will prepare now for getting its share of the money. Nobody is going to hand us the business on a silver platter.

★

Dumping Trade groups had better start now to promote in Government circles the idea that some plan for careful control in the disposition of surplus materials must be evolved for application when and as our armed forces begin to unload what they no longer need. Otherwise the electrical and other industries may experience another period of near-chaos, such as occurred after World War I.

What may happen is illustrated by a recent report published in *Business Week.* Last month the Quartermaster Corps in San Francisco sold 15,000 surplus windows to a building material concern in Oregon. The windows are now being sold for $2.38 each which is just 60 percent below current prices for such windows in that area.

Government policies that result in this type of dumping operations and bring disorganization and despair to regularly established business, should be changed and

(*Continued on page* 15)

DOES YOUR INDUSTRIAL SIGNAL BUYER NEED A *QUICK CHANGE* OF SIGNAL TYPE AT SOME CRITICAL SPOT *THIS MINUTE?*

SCHWARZE FARADAY

All Right!

HE CAN HAVE IT IF HIS SIGNAL SYSTEM IS *SCHWARZE-FARADAY*

UNI-PACT

By using the Schwarze-Faraday UNI-PACT System, the user may instantly replace one type of signal with another by merely plugging-in to the standard Uni-Pact base, with choice of Bells, Horns and Kodaires.

There's a Schwarze-Faraday Horn, Bell, Trumpet, Kodaire, Siren, Buzzer, Chime or Gong to do every signal job that comes to you. Each one completely modern, powerful, dependable,—doing an essential job with essential perfection.

Our engineering service is at your call, to assist in designing efficient use of signal equipment in your customers' plants.

Our current catalog, designed for exceptionally easy use by means of distinctively colored sections, clear captions, and cross-indexing, is for your convenience in selling.

THEY ALL FIT

SCHWARZE ELECTRIC COMPANY

1889 CHURCH ST. • ADRIAN, MICHIGAN

(*Continued from page* 11)
its up to the trade organizations in the different fields to instigate the changes.

★

Distribution Conference The fifteenth Conference on Distribution is scheduled for October 18th and 19th at the Statler Hotel, Boston.

Sponsored by the Retail Trade Board, Boston Chamber of Commerce, Daniel Bloomfield, Director, this conference is in every sense a national forum for distribution problems. Conference discussions have been found so interesting, stimulating and instructive, that attendance of executives of manufacturing, wholesaling and retailing concerns has increased steadily, year after year.

This year the program provides mainly for the discussion of problems created by the war effort, and a forward look toward the inevitable transition and post-war periods. Any executive who attends, will find the time and effort well spent and will come away with much valuable information and many workable ideas. Reservations should be made as far in advance as possible.

★

Five Boom Years We doubt whether there is any other single business concern that spends more effort and larger sums of money on market research and studies of business trends than does General Motors Corporation.

Therefore, when Alfred P. Sloan, Jr., Chairman of General Motors predicts a five-year industrial boom after the war he probably had plenty of authoritative data to back up his prediction. However Mr. Sloan thinks also that immediately after the fighting stops, we must expect a few months pause for adjustment.

Well, who wouldn't be willing to spend a few months adjusting the business carburetor in order to be ready for a five-year pleasure ride?

★

Cover The generating of a good cover-idea is one of those chores that an editor faces with each issue. Sometimes they come easy, other times it takes a staff meeting to produce a satisfactory cover design.

We are indebted to the Westinghouse Electric and Manufacturing Company for the fine picture that adorns the cover of this—The Fourth National Lighting Show- IN-PRINT and hereby extend thanks for most excellent cooperation.

With fluorescent hailed as the light of the future, what could be more appropriate on the cover of a Lighting Show issue, than a picture showing fluorescent tubes "in the making."

★

Merchant Marine A few months ago on an Eastbound train one corner of the lounge car was crowded with youngsters 17 or 18 years old, drinking Coca-Cola and noisily playing some sort of game with cards and matches. Hailing from Northern Minnesota and the Dakotas, they had enlisted in the merchant marine, were bound for training school. They were husky boys, most of them with blue eyes that bore witness to their Viking ancestry.

Landlubbers all, there was eagerness in the face of every one as their talk drifted to adventures ahead—seeing New York, seeing the ocean, getting into uniform, seeing the world, convoy voyages with lots of extra pay for hazards endured—visions of $1000 or $1500 in cold cash at the end of one perilous roundtrip to Murmansk.

Our thoughts flashed back to that scene and those boys, when a recent mail brought us a booklet giving some details of what our Merchant Marine has been, is doing toward winning this war.

It's a little 40-page brochure, well worth reading and worth keeping, and—it's free for the asking. Just address the American Merchant Marine Institute, 11 Broadway, New York 4, N. Y.

NO FALL CONVENTION

Because of the necessity for restricting war-time travel, the Management Committee of the National Electrical Wholesalers Association has announced that there will be no Fall Meeting of the Association this year.

However, in order to fill the need for intra-industry communication at a time when close cooperation among wholesalers and manufacturers is so urgently needed, both to aid the war effort and to help coordinate post-war thinking this publication will devote its October issue to

THE SECOND WAR-TIME CONVENTION-IN-PRINT

In this Convention-IN-PRINT we shall present an outstanding "program" of timely, instructive and interesting "speeches" by wholesalers, manufacturers, government officials and others, all grouped in a novel convention atmosphere.

Head-line "speaker" will be none other than Donald M. Nelson, Chairman of the War Production Board who has agreed to prepare a "speech," addressing all the wholesalers of the country through this magazine.

O. Fred. Rost, Editor

O. Fred. Rost

EDITOR

It's DIE-FORMED from a *Single Sheet of Steel*

Guth SUPER ILLUMINATOR

U.S. T.M. REG. & PATS. PENDING

HERE'S an engineering achievement—a Fluorescent Fixture that conforms to W. P. B. metal limitations—yet its Accessory Housing is completely formed in a single piece so that all operating parts are "under cover" for complete protection! It's unique construction produces an amazingly rigid, substantial unit—with added strength—yet the cost is no higher than that of ordinary Fixtures.

Masonite "REFLECTOR BOARD" Reflectors, finished "300° White" (88% R. F.), are easily removed and reinstalled with a quarter-turn of the "Flexible Trigger".

Fixture is easily installed—hangs anywhere—anyway! Eggcrate Louvres for extra lamp-shielding available if desired. "Bump-Proof" end-plates give added lampholder protection. Starters easily accessible even when fixture is mounted directly to ceiling. Maintenance is fast—easy. Suitable for single or continuous installation. Available in sizes for 2 or 3 40-watt lamps—or 2 100-watt lamps.

Here's Something Completely New in Fluorescent

...the GUTH QUICK-LITER

Here's the last word in Fluorescent development! GUTH QUICK-LITERS are identical to SUPER-ILLUMINATORS except that they are built with special ballasts; perfected for speedy, efficient action. Quick, positive starting ... **without the use of Starter Switches! Lower operating costs!** Tested in use for over a year and approved by users everywhere!

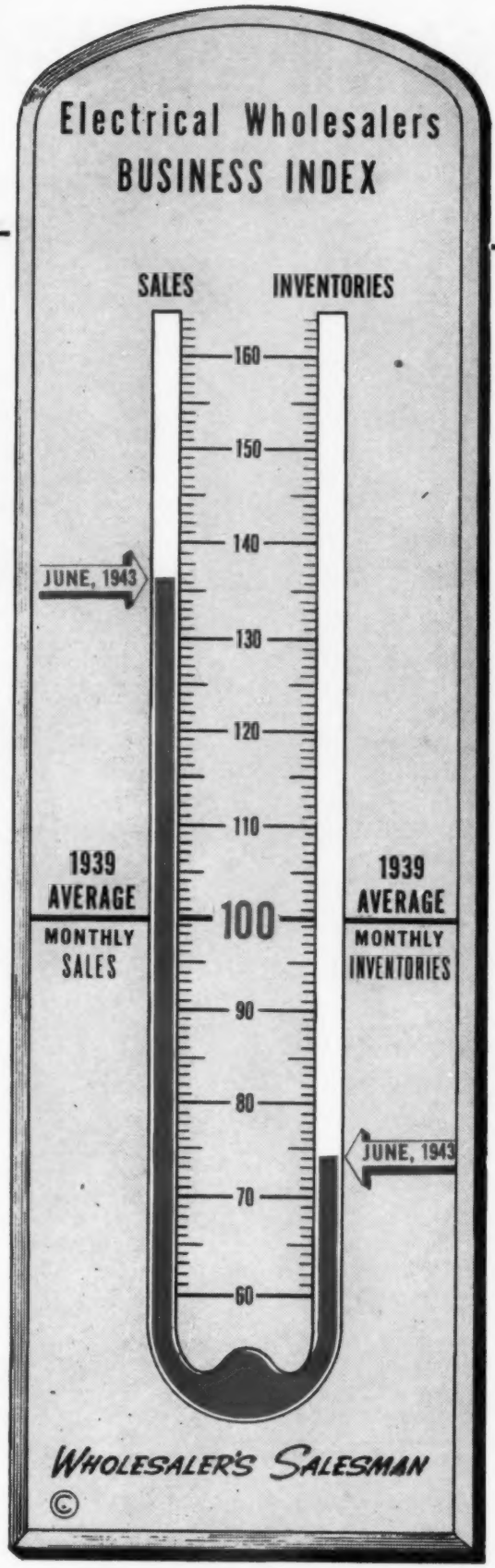
Write or wire collect. A Representative will call with actual samples to demonstrate superiority of these GUTH Fluorescent Fixtures.

★ ★ ★ ★ ★ ★ ★ ★

Leaders in Lighting Since 1902 Guth

★ ★ ★ ★ ★ ★ ★ ★

THE EDWIN F. GUTH CO. • 2615 Washington Ave. • St. Louis, Mo.



SOURCE The figures we use as basis for these monthly comparisons of performance in the electrical wholesaling field are collected and compiled by the Bureau of the Census of the U. S. Department of Commerce.

Business Index

For the Month of June, 1943

SALES Sales of electrical goods by wholesalers throughout the country remained at the relatively high level of 136 percent of the 1939 average monthly sales volume.

Compared with the previous month, sales were reported to be holding almost steady, with only a 1 percent drop registered in the total of 323 electrical wholesalers' dollar sales volume.

This may be considered an encouraging report as it indicates that the sales of electrical goods to war industry for maintenance, repair and operation are increasing to an extent nearly sufficient to offset the declining sales of both consumer goods and materials for new war construction.

It seems to provide further evidence of the growing trend toward a relatively steady business volume for the duration as war industry becomes more and more stabilized on a steady, full-time production schedule.

INVENTORIES The brightest note in the June performance record is the reported inventory situation with 281 wholesalers showing for June an average inventory at 74 percent of the 1939 average monthly level.

This marks for June the first time that the inventory curve, based on 1939 averages has swung upward in over 18 months, to be exact, since December 1941.

As this situation follows a month when inventory remained at the same level as the previous month, and when for four months previous to the gradually smaller declines were reported, it seems probable that this swing upward reflects more than just a reaction to sales fluctuations or the receipt of a few extra heavy shipments from manufacturers. It appears more likely that the flattening out of the inventories curve during the last few months indicates that gradually electrical manufacturers have been able to gear themselves to produce and deliver goods in sufficient quantities, so that wholesalers can resume their normal warehousing operations and need no longer resort to direct shipments as the best means of satisfying a customer. If this assumption proves to be correct a gradual upward swing of the inventories index will occur.

COLLECTIONS For the country as a whole, collection percentages in June averaged 74 percent, compared to a revised May percentage of 77. The figure for June was 2 points higher than that registered for collections in June of last year. Accounts receivable were reported as 4 percent below the previous month, and 27 percent below the accounts receivable reported for June 1942.

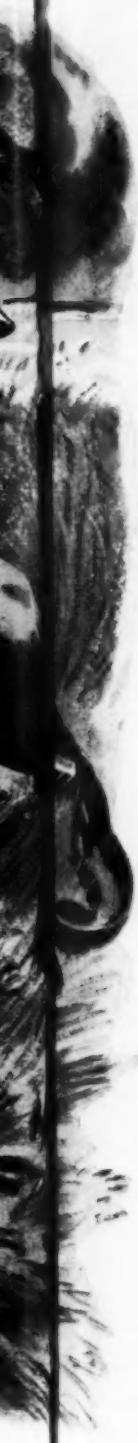
WHEN OUNCES FEEL LIKE POUNDS...

*Reg. U. S. Pat. Office

1230 SIXTH AVENUE
ROCKEFELLER CENTER, NEW YORK 20

UNITED S

S...ASSAULT TROOPS USE LAYTEX*



You know how it is. You slog along all day under full equipment. At first you don't mind the weight very much. But as the hours crawl along, everything you're toting gets heavier and heavier. The canteen you didn't notice in the early stages now weighs as much as your rifle did then. And your rifle feels like a howitzer. Every ounce turns into a pound.

That's why . . . when you're moving fast and the going is tough . . . it's smart to use Laytex Assault Wire.

A *full mile of Laytex Assault Wire weighs less than 30 pounds.*

Laytex Assault Wire has a breaking strength of 50 pounds per conductor and a talking distance of more than 5 miles.

Laytex resists concussion and a wide range of temperature changes.

It is flexible and waterproof, strong and tough.

Conductors are accurately centered and the weight of insulation and the diameter of the insulated conductor are kept at the minimum.

All this adds up to the fact that one man, wearing a breast reel of Laytex Assault Wire can move swiftly and easily. One man can maintain sure communication with operational headquarters.

Listen to the Philharmonic Symphony program over the CBS network Sunday afternoon, 3:00 to 4:30 E.W.T. Carl Van Doren and a guest star present an interlude of historical significance.

D STATES RUBBER COMPANY

WHOLESALER'S SALESMAN BUSINESS INDEX

REGIONAL ANALYSIS

JUNE, 1943

A PECULIAR distribution of sales is noted in the June record of regional performance. While the national average of sales for that month was 1 percent below May 1943, six of the nine regions reported increases in sales ranging up to nine percent higher than May. Dragging down the national average to a decline were reports showing only 89 percent of May sales in region 8, 91 percent in region 3, and 96 percent in region 2.

The most noteworthy feature of the regional sales record is the sudden upswing of sales in those regions that are made up primarily of agricultural areas—nos. 4, 5, 6, and 7. After taking a slump in May, when sales in those states ranged between 78 and 86 percent of the previous month's figures, these regions bounced back in June with sales at 100 to 108 percent of May volume. It seems probable that several factors contribute to this increase in rural sales. One would be the apparent success of the farm group's efforts to get larger allocations of farm machinery, equipment and supplies to make up for the drafting of farm labor. Another could be a more optimistic attitude in the agricultural regions over the prospect of an eventual "roll-back" government subsidy of farm prices, which combined with the prospects of one of the largest and most profitable harvests in history coming this fall, would tend to encourage buying.

If this trend toward higher prices on farm products caused the upswing of wholesaler's sales in non-industrial regions, the WPB revision of M-330, which allocated a percentage of wholesalers' electrical and other hard goods for un-rated farm orders, may result in an acceleration of that upswing.

The regional reports from the highly-active war-industry centers of New England and the Pacific Coast showed that wholesalers' sales in those regions had once again climbed above the previous month. But still puzzling is the continued slump in region 2, the Middle Atlantic states, and region 3, the East North Central states. It is a possibility that these declines may be a reflection of the frequently reported temporary slowing-down of certain war production, and a substantiation of the occasional government references to shut-downs in certain types of war plants. At least the possibility that those factors did influence performance must be considered when studying the slump in regions 2 and 3.

Figures in this table apply to the geographic divisions as outlined and numbered in red ink on map above

SALES JUNE, 1943 Compared in % with		Trading Region (See Map)	INVENTORIES JUNE, 1943 Compared in % with	
May 1943	June 1942		May 1943	June 1942
109	100	1	102	49
96	81	2	101	46
91	69	3	102	54
102	62	4	102	44
100	67	5	97	57
108	58	6	92	48
100	77	7	103	42
89	74	8	103	46
106	91	9	100	57
99	**77**	For **U. S. A.**	**100**	**51**

WHOLESALER'S SALESMAN NEWS

WPB Drops Restrictions On Commercial Fluorescent Fixtures

Permits manufacture of non-industrial fixtures after December 1st. Action seen as opener to large lighting market for wholesalers and retailers

COMMERCIAL fluorescent lighting fixtures soared suddenly out of the gloom of government limitations on August 18th when the WPB announced that these much-needed fixtures could be manufactured after December 1st, 1943.

To the wholesaler, whose shelves long since have been bare of these fixtures, and to his contractors and retailers, hard-pressed as they are for suitable products to sell, the amendment to L-78, brings visions of the great possibilities in lighting sales now available to them.

Coming availability of commercial lighting fixtures restores to these wholesalers and their customers the chance to sell the thousands of offices, stores, commercial buildings and other waiting markets, that are sorely in need of adequate lighting equipment. Particularly, it opens the way to the selling of good lighting to the many structures built or wired since L-78 went into effect in the Spring of 1942, and to the even larger market made up of those establishments badly in need of re-lighting to help them meet the strains of wartime operation.

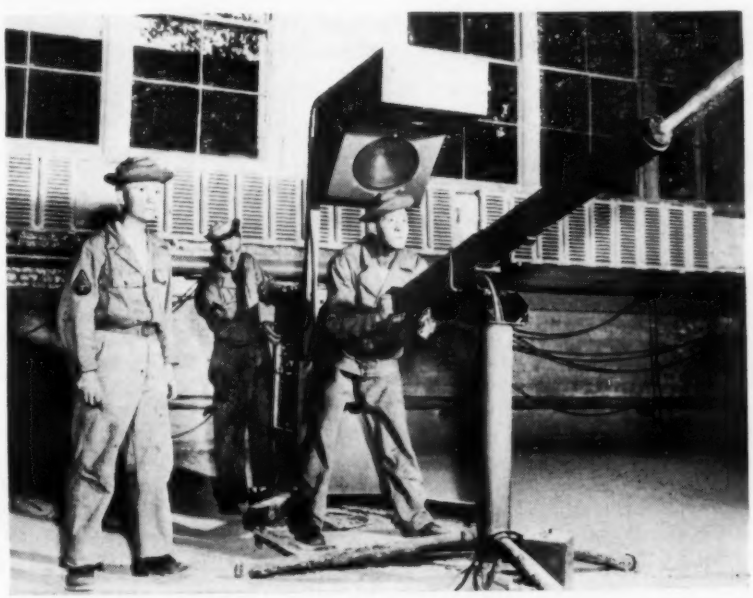
As the revision of L-78 placed on these fluorescent fixtures the same restrictions on weight of metal that have been imposed on industrial fixtures, the order challenges the designers of commercial fixtures and the suppliers of components to produce practical and suitable war-models. However, it is felt that, following all the experimentation in meeting the limitations for industrial fixtures, the manufacturers are well-equipped to solve this problem. Available to them are all the decorative possibilities inherent in the use of glass and plastics, as well as the peculiar qualities of wood and pressed composite materials.

Restricts Industrial Fixtures

At the same time, the amendment to L-78 prohibited the manufacture, without special WPB authorization, of several types of industrial fixtures formerly permitted. Also the weight restrictions were extended to include all industrial types except three.

Retailers were stopped from selling inventory without ratings, a practice formerly permitted on application to WPB. The sale of fixtures between manufacturers and wholesalers was also prohibited except on rated orders. Deliveries for "storage" were stopped, although deliveries for test and demonstration are still permitted.

Industrial fixtures, the manufacture



AMMUNITION SAVER, designed for the Army by two electrical firms, Edison General Electric and Operadio. It is a machine gun trainer which simulates battle conditions even to the noises of planes and cannon. In one hour, it is said to save $10,800 worth of ammunition. The public is getting a view of it at the traveling Army War Shows.

of which was prohibited after September 8th, are:

Those with one hot cathode tube or bulb rated 30 watts or higher.

Those made up of four or more hot cathode tubes or bulbs of any wattage arranged in parallel except under certain specifications.

A continuous row of single hot cathode tubes or bulbs of any wattage.

Two or more hot cathode tubes or bulbs of any wattage arranged in parallel rows except under certain specifications.

Wholesaler Group In Civilian Supply Office

Wholesale and Retail Trade Division of WPB, wherein lies all government control of the electrical wholesaler's activities, has been transferred from direct WPB control to the Office of Civilian Requirements as part of a recent directive from Charles E. Wilson, executive vice-chairman of the WPB.

It is believed that the move was made to provide the most effective way to handle the current problem of wholesale and retail distribution of consumer goods. And it is thought, too, that it creates a pattern of operation through which distribution of civilian goods can be better controlled when their production is increased as war demands lessen, and by which equitable distribution can be obtained when, after the war ends, industry turns its facilities completely to consumer goods.

As the directive gave OCR power to direct industry divisions of WPB in the selections of types of customers to whom manufacturers and producers may ship goods, but did not give them permission to issue an order directly to manufacturers working under the CMP, this change in location of the divisions should have little if any effect on the wholesaler's handling of industrial supplies.

Several facts concerning the current activities of OCR have been pointed to as an indication that it is very much interested in the current condition of wholesalers' and retailers' inventories. For instance, it was revealed that OCR has established "listening posts" in 22 major trading areas for the purpose of forestalling shortages. Warnings of impending shortages, as received mostly through wholesale channels, will provide ample time to check the essential status of the item, and to arrange for its expanded manufacture before an acute shortage exists in the retail end.

It is reported from Washington that

(Continued on page 120)

***FOR EXCELLENCE** in the production of textile webbing and precision metal parts, The Wiremold Company, Hartford, Conn., was awarded the Army-Navy "E" last month. Shown above at the presentation ceremonies are, left to right: Edward T. Quinn, an employee; Captain A. K. Atkins, USN; Pfc. D. T. Dannelle, representing the Armed Forces overseas; Mrs. L. M. Francoeur, an employee; D. Hayes Murphy, president of Wiremold; Col. R. T. Stevens, QMC, USA; Mrs. M. F. Cote, an employee; H. Martocchio, chairman of the war production drive committee.*

CONTRACT NO. W-1097-ENG-3274
TELEPHONE BAYONNE 8-0373
P. O. BOX 8 BERGEN POINT STATION

CHAS. F. VACHRIS, INC
GENERAL CONTRACTORS
U. S. ARMY
MOTOR VEHICLE INSPECTION AND SERVICE INSTALLATION
SECOND AND HOBART STREETS
BAYONNE, N. J.

31 July 1943

Joseph Kurzon, Inc.
112 West 31st Street
New York City, New York

Gentlemen:

We wish to extend to you our sincere thanks and appreciation for your promptness in filling orders for material purchased from you and used in war construction at the Port Johnston Terminal.

We feel that the expediency shown by you greatly assisted us in being honored by our government with the Army Navy "E" Award.

Sincerely yours;

Edward De Vito
Electrical Superintendent

Jerome Govedale
Electrical Purchasing Agent

ARC ELECTRICAL CONSTRUCTION CO.,INC.
739 Second Avenue
New York City, New York

:maf

***WHOLESALER HELPS** "E" award recipient. Joseph Kurzon, president of Joseph Kurzon, Inc., New York City wholesaler, received the above acknowledgement from an important Army contractor and forwarded it to* WHOLESALER'S SALESMAN *as another example of how important an electrical wholesaler's services can be in the war effort.*

4th National LIGHTING SHOW IN PRINT

STAGED BY

WHOLESALER'S SALESMAN

SEPTEMBER • 1943

Let's Get Going!

WHEN the complete war record of the lighting industry can be written it will be one of the outstanding accomplishments, one of utmost cooperation with every government and war agency. Indeed, it will be a record of which all concerns and individuals engaged in the lamp and lighting equipment business may justly be proud.

For example, in their service to war plants the lighting representatives of wholesalers, contractors, utilities and manufacturers already have helped to add upwards of 200,000,000 man hours of war production per year—through getting proper lighting into hundreds of war plants, old and new.

Figured at the currently moderate rate of $1.00 per hour, this means that the lighting industry has helped to reduce our war cost upwards of $200,000,000 per year—an impressive total even in these days of astronomical figures.

The industry's achievements in developing highly specialized new lamps and devices for the use of our armed forces are too numerous and too secret to mention here, but they have contributed substantially to higher efficiency and greater effectiveness of our fighting equipment. Yes, indeed! It's a good war record we have, no matter what the yardstick.

WHAT will our peace-time record be?

In 1940 the lighting industry was approximately an eight hundred million dollar business, with fixtures, bulbs, installation costs and current included.

In 194?—the first year after the fighting has stopped and for many years after that, it can easily stay at 25 to 50 percent above that 1940 figure. . . . IF WE LEARN *NOW* how to think big enough, IF WE DEVELOP *NOW* the course to follow and—IF then we have the sense to recognize sound leadership and the guts to steer the course that was set.

No industry can perform the maximum of service to the public, have maximum employment, reach maximum efficiency, unless that industry is making a fair profit and—there can't be a fair profit if the prevailing philosophy of competition is that of price alone, with quality, efficiency, service and user satisfaction disregarded.

Much as we regret to admit it, the past history of the lighting industry shows a strong leaning toward that philosophy. In fact, its prevalence reaches epidemical proportions whenever an improved or new light source comes into the market—witness the "gold rush" when tungsten lamps replaced carbons, when gas-filled lamps made tungstens an antique, and—within memory of us all—that super "gold rush" when fluorescents appeared on the lighting scene.

While such a "gold rush" is on, all too few of us give any thought to the fellow at the end of the line—the final consumer. He really has a right to expect the proper quantity and quality of it when he is actually buying light.

True, it's good policy to cash in on a popular trend. When the masses are ready to buy—shoot the works, BUT—YOU DON'T HAVE TO HAVE SHODDY FIXTURES, POOR DESIGN, FILMSY CONSTRUCTION, because it is equally true that when the masses get the buying fever for some radically new thing, they'll pay a fair price to get it, AND THEY DON'T WANT CHEAP JUNK but their money's worth.

Furthermore, when the masses are "sold" on something new, like fluorescent light for instance, why should anybody make cheap and inefficient stuff and then send out salesmen, who don't know a thing about quality lighting but do know that they have a catalog under their arm and a discount sheet that's got enough extra "ten's" to beat any competitor. WHY?

TODAY the lighting industry once more stands at the cross-roads—a privilege that is rarely enjoyed by any industry, new or old, more than once in a lifetime.

But, fortunately the fluorescent's "gold rush" was checked before it got its full growth and so the industry has its second chance.

In the industrial field fluorescent light has established its superiority so firmly that future re-lighting of America's thousands of factories with any other type is unthinkable at this writing.

Similarly it is inconceivable that stores, offices,

commercial buildings, schools will relight with anything other than fluorescent.

In the residential field, fluorescent has not even made a pin-prick and it's anybody's guess as to how many fluorescent units America's 28,000,000 wired homes will buy in the first five post-war years, but—it's certain that the total will be a staggering figure.

When you add other lighting applications—streets and roads, airfields, infra-red, bactericidal, decorative, advertising, the potential sales total soars to figures that were undreamed of but a few years back.

WHICH road shall we take?

The easy road is the one that for a brief distance means big sales, cheap products, quick profits, where a little further on we would find the awakening of a cheated public and finally wrecked confidence and many wrecked concerns.

The other road is somewhat more difficult but it's longer, in fact endless, and it leads to steady business, fair profits, millions of satisfied customers and—to a permanent place among America's great industries.

Every concern or individual in the lighting industry has the privilege and opportunity to travel that road of golden opportunity and reap the great rewards that it makes possible, if there is the willingness to meet the obligations that are involved.

Most important of these is the obligation to give the user the best there is in lighting, from the standpoint of adequacy, safety, efficiency, comfort and health. The products must be worth the price asked for them and the policy of selling must be sound, constructive, cooperative and yet competitive. The industry as such must plan on the basis of providing for a long period of employment for the maximum number of people in manufacturing, distribution and selling, as its just obligation in the post-war period, when The American Way of Life, the Free Enterprise System will undergo its most crucial test.

All this can be accomplished successfully, if we learn now how to think big enough and begin to make use of the leadership that can start and keep us travelling on that better road.

The National Better Light—Better Sight Bureau—one of the finest educational committees existing in any industry—has for years struggled along on a budget for national operation which is probably less than what the government is spending for a small local OPA office.

Is that thinking big enough?

The Illuminating Engineering Society—one of the country's outstanding technical societies—has had great difficulty in getting enough financial support for putting out an educational film to help the war effort through better lighting technique.

Is that thinking big enough?

The groups of manufacturers who promote certified lighting equipment as a means of maintaining safe standards obtain inadequate support from the industry and even from some of their own members, thus shrinking the benefits that accrue to the consumer from such cooperation.

Is that thinking big enough?

Too many wholesalers and contractors have given little or no attention to the proper training of their staff in good lighting practice, and have traded on the ignorance of their customers, their main objective being to get the order at any price.

Is that thinking big enough?

Too many utilities have limited their promotions for better lighting to short periods, "token" campaigns, despite the fact that they represent the one branch of the electrical industry, which benefits permanently, month after month, year after year—yes, forever—from all that is done, hence automatically they are marked as the logical leaders of all local promotional activities.

Is that thinking big enough?

THOSE then are the major ruts on that better road, which the lighting industry must fill in, smoothen out, pave in the sweat of determination, before the going will be good for all and for a long, long distance.

We have already the talent, and the leadership, and the resources to do all that is needed to make that better road one of the finest courses, ever travelled by any industry, spreading service and benefit to the public, gaining maximum sales, maximum sustained employment and—fair profits to all who observe the rules of the road.

And—I believe sincerely that the industry not only can think big enough, but also has the guts, to start now turning its course into that better but more difficult road, which shows that long long trail of service, satisfaction and profits ahead?

Let's get going!

EDITOR

When Does It Pay to Install

By John Neidhart*

WITH our nation in the midst of a supreme effort to maintain and even step up war production, plant engineers are confronted constantly with the important problem of lighting buildings for maximum efficiency. Adequate lighting is vital to our war effort. Foremost among the benefits are:

1. Increased production—it takes time to see but this time may be materially shortened if adequate light is provided.

2. Greater accuracy—clear seeing is essential to precision work.

3. Fewer accidents—thousands of manhours are lost because of industrial accidents which could have been prevented if the danger had been seen before it was too late.

4. Fewer errors—the saying that an ounce of prevention is worth a pound of cure is especially true in these days when we dare not waste our limited supply of material.

5. Less fatigue and eyestrain—seeing is work and if this part of a worker's job is made easier by proper lighting, he will have a greater reserve of energy for the longer hours and the greater pressure under which he must work today.

6. Improved employee morale—a bright and cheerful atmosphere will do much to dispel the defeatist attitude that may accompany long hours in the factory.

The importance of good lighting is generally recognized by industry, but it is difficult to decide which of the many methods of lighting available should be employed. Of the three light sources which may be used incandescent, mercury and fluorescent, the fluorescent lamp has been subject to the most attention recently. Unfortunately the initial cost of fluorescent lighting equipment is rather high, and there are many who believe that it would not pay to install this type of lighting in their factories. Such jumping to conclusions without considering anything but the greenbacks involved, often leads to wrong decisions.

It is obvious that it would not pay to install an inexpensive lighting system if it does not enable the employees to see quickly, clearly and accurately. The final selection of the best type of lighting for a given application must be the result of a careful analysis of the nature of the visual task and the quantity and quality of light required. It may also be desirable to determine the annual cost of lighting although this is of secondary importance.

Special emphasis should be placed upon the nature of the visual tasks, for the selection of the most suitable design of the lighting system hinges upon the type of work involved. Every task in our work world is first of all a seeing task whether it be operating a precision lathe, assembling a plane, tank, or gun, or inspecting parts and final products. Many of these tasks involve the perception and discrimination of fine details, while others are less severe task-masters upon the eye. Polished and semi-polished curved or flat surfaces are frequently encountered; at the other extreme, relatively dark materials of poor contrast must be worked upon Thus it is evident that the varying nature of the visual task demands a tailor-made lighting system for each application.

Quantity of Illumination

The amount of or intensity of light required depends upon the difficulty

Rows of fluorescents converge on the P-38 "Lightning" fighter which this well-designed lighting system helped speed along the production line.

Fluorescent Lighting?

of the seeing task which must be performed. Modern recommended practice is to provide footcandle intensities in the order of those given in Chart I. Under varying circumstances, the footcandles given in this chart may range from 30% below to 40% above the value given. Although intensities of 50-100 footcandles can now be provided by general lighting systems, it is frequently desirable to provide extra high intensities desired by means of a combination of general and supplementary lighting. Such practice is particularly applicable to lighting a few scattered precision machines or fine inspection benches. General lighting is, however, usually the most satisfactory and should be considered as basic to all installation design.

*Lighting Engineer,
Westinghouse Electric & Mfg. Co.,
Cleveland, Ohio

Quality of the Light

It is not enough to provide merely an adequate amount of illumination, it is just as important that the light be of proper quality. To be of proper quality, the light should be uniformly distributed, well-diffused and free from direct or reflected glare. Non-uniformity makes it necessary for the eye to continually adapt itself to the varying brightness levels which it encounters. Poor distribution also results in harsh, dark shadows which greatly increase the difficulty of seeing. Proper spacing of the lighting equipment will insure uniform light distribution. In general, the spacing between diffusing type direct lighting units should not exceed their mounting height above the floor.

Glare in one or both of its two forms is an evil prevalent in all too many exciting lighting installations. This is indeed unfortunate, for it is, in effect, negative illumination which reduces visibility and results in annoyance and eyestrain. Direct glare may be caused by high brightness being directed toward the eye by unshielded or improperly shielded light sources. Reflected glare results when high brightness sources are reflected from a specular or polished surface. The prevention of both forms of glare is a "must" which cannot be neglected.

Annual Cost of Lighting

When there are two or more ways of obtaining the required illumination for the visual tasks being performed, it may be desirable to compare the economy of the lighting systems by means of a cost analysis. The results of the cost analysis will, however, be valid only when the lighting systems being compared provide light of similar quality and quantity. For example, we cannot compare a 10 footcandle installation with a 50 footcandle system, nor a glare and shadow producing installation with a glareless, well diffused lighting system. Such an economy study should compare the alternatives from the long run point of view, for true economy is getting the most for your money in the long run. The major points of a cost analysis may be outlined as follows:

A—Fixed Charges:

1. *Annual Depreciation*—will be a fixed percentage of the installation cost (including wiring) depending upon the Amortization time. The amor-

Seemingly endless rows of fluorescent fixtures light these Consolidated "Liberator" bombers as they are rushed to completion. Photos from OWI.

CHART I

RECOMMENDED INTENSITIES

	Foot-candles
Extra fine work such as required in making precision instruments, extra-fine inspection, sewing dark goods, extra-fine bench and machine work, etc.	200
Very exacting and prolonged seeing tasks such as fine bench and machine work, extra fine hand painting and finishing and for the discrimination of fine detail of low contrast as in working with dark cloth.	100
Severe and prolonged seeing tasks such as medium bench and machine work, medium fine assembly and inspection.	50
Moderately critical and prolonged seeing tasks such as rough bench and machine work; medium assembly and inspection, hand painting and finishing and for working with light cloth.	20
Visually controlled work in which seeing is important but more or less interrupted or casual and does not involve discrimination of fine details or low contrasts for rough manufacturing processes such as molding clay products and cements, glass blowing machines, billet, blooming and sheet bar mills in steel manufacturing. For stock rooms and active storage areas where a variety of small articles is handled.	10
Crude manual tasks intermittently carried on such as grinding clay products and cements, hand furnaces and boiling tanks in chemical plants, stock rooms and active storage areas for medium sized materials.	5

Note: For more detailed recommendations, consult American Recommended Practices of Industrial Lighting as approved March 17, 1942.

tization time may range from 5-20 years depending upon the industry or their established accounting methods.

2. *Interest, Taxes and Insurance*—may be considered as averaging 5% of the installation cost.

B—Operating Charges:

1. *Annual Cost of Lamp Renewals—should include cost of* labor to renew lamps as well as total cost of lamps. The number of lamp renewals will be governed by the annual operating hours, the rated lamp life and the type of lamps used.
2. *Annual Maintenance Cost*—an allowance for regularly cleaning the lighting equipment to prevent excessive dust accumulation.
3. *Annual Energy Cost*—will be governed by power rate and operating hours.

The annual cost of the lighting installation will be the sum of the fixed charges and the operating charges. Mere cost is, however, no measure of lighting effectiveness. A few dollars saved each year on lighting costs may be greatly outweighed by spoiled production, accidents, lost time, or personal discomfort. Thus, the advantages other than efficiency must be measured. These advantages are so intangible, however, that the measurements can only be in terms of general results. While it is often inconvenient that such advantages cannot be converted into a simple momentary value, the advantages exist nevertheless and therefore their importance must not be ignored or overlooked.

Answering The Question

Having a better understanding of the requirements that a modern lighting system must satisfy, we need only examine the characteristics of the light sources (Chart II) and types of luminaires to determine which will best meet these requirements.

The luminaires for incandescent and mercury lamps are very similar in design since the size of both sources is practically the same. The simplest of these are merely open reflectors which direct the light downward and shield the lamps to a certain extent. They may be designed for either high or low mounting heights and may be provided with glass covers to maintain efficiency and minimize maintenance. Certain types of reflectors do not eliminate direct glare from the high brightness lamps and are, therefore, not as desirable for precision seeing. Specular or shiny surfaces will cause annoying reflected glare from some reflector units and this fact then constitutes a definite disadvantage. The reflected glare may be somewhat reduced by introducing a diffusing glass, but such equipment is more difficult to maintain than open units. Another method which is sometimes applicable is to use a silvered bowl incandescent lamp in an open, diffusing reflector.

The porcelain-enameled RLM reflectors for fluorescent lamps which are in common use today, together with the inherent features of the lamp itself, offer many advantages which cannot be easily overlooked. The low brightness of the lamps plus the shielding provided by the reflectors reduces direct glare to a minimum. Wherever necessary, the addition of louvers or diffusing glass covers will virtually eliminate all direct glare. Likewise, reflected glare from shiny surfaces is minimized by fluorescent luminaires. Due to the diffusing characteristics and extended shape of these luminaires, shadows will be very soft and pleasant and good uniformity of illumination may be easily obtained. Fluorescent luminaires are readily adaptable to continuous strip mounting, and many such installations are being made today (Figure 1). The continuous strips give the installation a neat appearance and greatly reduces the apparent number of units. They also insure optimum visibility of working dials and micrometers by providing a broad band of light background against which the dark numbers and scales are clearly outlined.

Typical Examples

Let us pretend that we are the manufacturer who is modernizing his plant and wishes to light a tool room. The visual tasks involve the reading of working dials and micrometers, scribing metal surfaces, medium bench and machine work and medium fine assembly. Ac-

curacy and precision are of prime importance, for every slight flaw in a tool will be mirrored in the product for which it is used. The materials worked with are almost exclusively specular metals as are the micrometers and dials the worker must depend upon for accurate results. From Chart I, we see that the illumination should be in the order of 50 footcandles and the characteristics of the visual task indicate that a well-shielded, low brightness source will be required. We shall, therefore, not even consider the inexpensive open reflector type incandescent or mercury luminaires since the reflected glare and possibly direct glare from these units would be too objectionable. Luminaires having diffusing glass bowls or globes would be more desirable, but the following advantages of a continuous strip fluorescent convince us that it would pay to install the fluorescent lighting.

1. *High efficiency*—The fluorescent lamp is not only considered a highly efficient light source, but the overall efficiency of the luminaire has made it more popular today than that of the majority of the other types available. Also, since the color quality of the mercury light usually makes it desirable to use this lamp in combination with incandescent lamps, the buyer of actual luminous efficiency will, therefore, lean toward the most simple installation.

2. *Low brightness*—The brightness of the fluorescent lamp is much lower than that of other types so that the problem of shielding of the brightest areas is simplified.

3. *Diffusion*—The large area and extended shape of the fluorescent luminaire provide diffusion and freedom from shadows that cannot be rivaled by smaller diffusing sources.

4. *Less heat to be dissipated*—Where heat is a factor the high efficiency of the fluorescent lamp and luminaire enable us to provide the required amount of illumination with less wattage. This means that less heat will be generated in the room and the employees will, therefore, be more comfortable. If the room were air conditioned, both the capacity and load of the air conditioning system would be materially reduced by installing the fluorescent lighting. The fluorescent has a further advantage in that only half of the heat is radiated downward upon a person below the fixture.

5. *Reading dials and micrometers*—The advantages of continuous strip lighting for these important visual tasks has already been pointed out. Small individual sources will be reflected as small bright spots in a dark background, and visibility of the scales will be very poor.

As a second example we will consider the lighting in one other type of new building. Here the tasks are moderately critical and prolonged and are chiefly medium assembly and inspection. We decided, therefore, that about 25-30 footcandles will be adequate. This area differs from the tool room of our first example in that it is much higher and the lighting equipment must be mounted above the crane rails at a height of 30 feet. If this were a foundry or steel mill, high bay luminaires having a medium spread distribution of light would be most applicable. The visual tasks which must be performed in this building, however, require better diffusion and lower brightnesses than such an installation would provide. The same type of equipment as proposed for the tool room will, therefore, be appropriate here although a greater spacing between units will be permissible at the high mounting height and higher wattage lamps may, therefore, be used. As in the tool room, the advantages of fluorescent lighting for this application are outstanding. Individually mounted fluorescent luminaires for 2-100 watt Mazda F lamps are, therefore selected as the most paying proposition in long run benefits.

Light for Production To Win

Today we are confronted with the tremendous task of winning a war. To win this war we must utilize our production capacity to its fullest extent. We cannot measure the value of increased production in dollars and cents. We must achieve victory at any cost. Wherever fluorescent lighting in our vital war industries will help us win this war, it will pay to install it.

CHART II

LAMP COMPARISON CHART

Characteristic	Lamp Incandescent	Lamp Mercury	Lamp Fluorescent
Sizes available	100-1500 watt	250 and 400 watt	15-100 watt
Physical shape	Small — globular	Small — tubular	Long extended shape
Efficiency	14-22 Lumens per watt	25 and 37 Lumens per watt	22-42 Lumens per watt
Brightness	High brightness	High brightness	Low brightness
Color rendition	Good, but deficient in blue. Must be corrected for true white light	Marked color distortion. Red objects appear black	Eight colors available. White light may be closely approximated. 3500° white usually best
Starting	Instantaneous self-starting	Self-starting 3-5 minutes to reach full output. Slow restart	Requires separate starter. 2-3 seconds time delay
Stroboscopic effect	Practically none	Noticeable in case of rapidly moving objects	Not noticeable with two lamp unit
Power factor	100% — no correction required	Corrected to 90-95%	2 lamp units 95-100%. Single lamp units may be corrected to 90-95%
Auxiliary equipment	None required	Transformer-ballast required	Transformer-ballast required
Behavior at end of life	Lamp goes out	Lamp may glow dimly	Lamp flashes on and off unless special starters are used

Through Steady Promotion of This Wholesaler

With 60 percent of his volume lost through war-time restrictions, this wholesaler turns to lighting as substitute volume builder, scores outstanding success

IT was in June, 1941, that we came to the definite conclusion that our appliance business was doomed for duration, and that we had better make some definite, sensible plans to replace it, if we wanted to remain on a sound operating basis.

Our appliance business constituted about 60 percent of our volume, with supply and lighting business making up the balance. Obviously the problem was serious.

Our final decision was that our lighting business offered greatest opportunity for immediate increase and profit. Our profit rate had always been better in lighting than in our supply business, and the potential that the then new war contracts offered for the relighting of old plants and installations in new plants with new fluorescent fixtures was almost unlimited. Therefore, we settled on lighting to do the job for us that we wanted done.

Fortunately, we already had with us a trained lighting engineer, who was handling lighting in conjunction with other work. Our first move was to set him up so he could devote all his time to the lighting business.

From then on, the steps we took were the only ones you can take if you want to organize to do a successful job.

From the manufacturers we represented, and who had been responsible for the bulk of the outstanding

The men who made Elliott-Lewis a factor in the lighting business are seen here as they attended a "Build-a-Bomber" dinner. Left to right: John R. Canning; L. G. Bright; Phil Drass; Albert Prow; F. R. Elliott, Jr.; J. T. Ellis; J. W. Carpenter; C. M. Oldach; F. T. Gain; R. D. Clayton.

Good Lighting Offsets Lost Sales Volume

Recognition to the Elliott-Lewis Electrical Company for its successful conversion to the lighting business came at a "Build a Bomber" dinner at Philadelphia's Hotel Warwick. Attending were, left to right: Frank R. Elliott, Jr., president; Orville F. Haas, general manager of the Continental Division of General Electric's Lamp Division; John T. Ellis, manager of the Lighting Department at the Elliott-Lewis company.

By Frank Elliott, Jr.*

commercial and industrial installations in our territory, we purchased a quantity of fluorescent fixtures which gave us three times the stock we normally carried.

This stock proved to be the most important single factor in the success our lighting department subsequently enjoyed. Never, however, did we charge one penny more than our customary price for a fixture, even when there were no more available anywhere.

Our next move was to do all we could to equip our salesmen for the job of talking and selling lighting. We made special efforts in the case of a group of 4 former appliance salesmen to whom we were already giving extensive training on the supply business in general.

This special training on lighting consisted of I.E.S. group lectures, test problem meetings by engineers from General Electric's Mazda Lamp Department, talks by the manufacturer's representatives on their own particular products, and visits to plants etc., having outstanding installations of fluorescent lighting in all its applications.

Our next move was to advertise our stock and facilities high and wide. Our greatest success in this line came from a special folder we prepared at the time W.P.B. prohibited the manufacturers from making any more commercial type fixtures. We designed and wrote this folder ourselves and used a mailing list we purchased of every retail store, office, commercial building, etc., in our territory. We have also, of course, consistently used our industrial and contractor mailing list.

Finally, we set up prize contests for our men for doing a good lighting job. We have awarded war bonds in these contests, and they have in our opinion, been outstandingly successful.

Whenever the opportunity existed, we tied our own contests in with those of the manufacturers. For instance, in General Electric's "Bomber Builder" campaign we had two men consistently at the top in this national activity. We have received credit for building 35 bombers, and we are awaiting approval for 12 more.

As an example of what all this effort on lighting means to us, above and beyond the regular lighting jobs that every wholesaler sells, we sold the first 3KW lighting installation in this area, and so far as we can learn, the only three jobs that have been installed up to now, were sold by us.

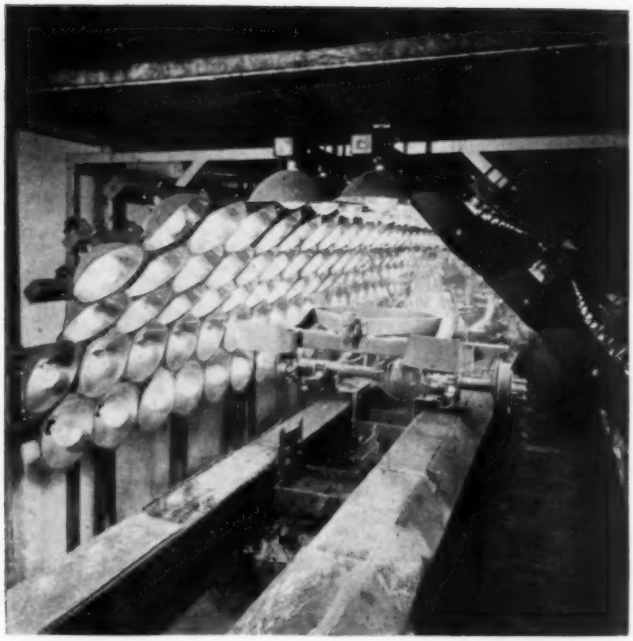
The results have been exactly what we hoped for. Our lighting business almost exactly equalled our 1940 appliance business, our sales organization is on its way to bigger and better installations, and we have become recognized as a leading lighting equipment house in the area we serve.

---

* *President, Elliott-Lewis Electrical Company, Philadelphia, Pa.*

Selling Infra-red..

By Williard S. Crandall*



Infra-red equipment inside an old convection heating oven now quick-dries the paint on Army auto chassis.

PRODUCERS' goods which compete most with the war effort have been restricted in this war economy market. Goods which assist the prosecution of a successful war have received more responsible assignments, and certainly equipment to operate the near infra-red process has established itself as a vital production tool, speeding war goods. The responsibility for sensible selling has not changed—only the potential user has been marshalled into more condensed or intense industry groups which logically need the process to eliminate industrial production bottlenecks.

In manufacturing, a corporation must design and build a product as good as can be produced with a skilled organization, quality materials and modern equipment; the product and its utility must be presented intelligently by accepted forms of printed sales promotion and personal contact; and a program must be adopted that will insure the user of the product all the service built into it at the factory.

Equipment to operate the near infra-red process is sold successfully only when a sales engineering approach is employed.

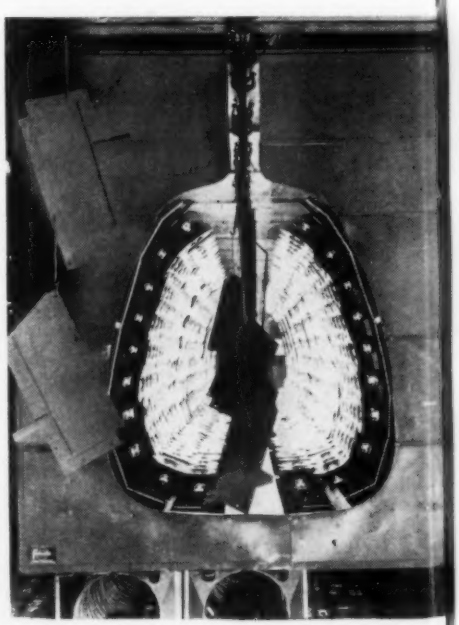
The selling job starts with determining those plants which have a drying, baking, preheating, dehydrating or similar operation in production or maintenance—or both.

The next step is to convince the men in charge of production and maintenance, that on its record the near infra-red process deserves investigation. Actually, conventional selling stops at this point. Once a prospect is sold on the idea that the process may possess advantages for him, the job is to prove whether or not these advantages exist.

Proving the point involves "job-testing"—applying the process directly to the prospect's problem. He will not buy until he is convinced the process is a logical and practical solution. Establishing the solution, and making equipment recommendations with operating procedures, is a job for the sales engineer. Only in rare cases should the prospect make his own tests, for the process is relatively so new enough that as yet comparatively few people know very much about its characteristics or at best do no know enough to make fool-proof determinations.

Therefore it is highly desirable that wholesalers' salesmen take advantage of the engineering services, which are made available by the important manufacturers of infra-red equipment to assist manufacturers in determining if the near infra-red process may offer a solution to their problem. If initial investigations are positive, concrete suggestions regarding equipment are then supplied, and much needed guidance is provided to help obtain the forecasted results. Only with adequate laboratory equipment and trained personnel is it possible to make satisfactory "job-tests." Furthermore to logically solve production problems there are required various pieces of infra-red equipment and industrial finish formulations—or tools with which to test many types of problems, and these only a manufacturer of such equipment will have available.

Earlier the statement was made that near infra-red process equipment is sold best when a sales engineering approach is employed, and in that connection several requirements appear at once as an opportunity and an obligation for the sales engineer who cooperates with the wholesaler's salesman in developing an order. Obviously he must have the ability to make sound and work-



In selling such an installation as this, the sales engineer must balance factors such as conveyor speeds, paint application times, product handling, logical maintenance requirements, etc.

..Under Present Conditions

Three basic principles should guide merchandising activities. The Road to Market for Infra-Red equipment actually begins at the factory and follows through to the user and prospective user. The road map is simple

able recommendations, for unreliable results are worse than none at all. He must be qualified to reduce recommendations, if necessary, to mechanical drawings for further discussions with technical men representing the buyer. In the matter of testing facilities and display equipment, it is desirable that the salesman or engineer is supported by engineering materials which perform the two-fold purpose of obtaining accurate testing results while leaving no doubt in the prospective user's mind of the extent to which the process will serve his requirements.

Publication advertising, direct mail promotional material, market research, and other factory activities of many infra-red equipment manufacturers are designed and carried forward to identify the available engineering and sales services in the minds of prospective users in each area.

Unfortunately there are today entirely too few wholly qualified sales organizations so far as infra-red is concerned, and one reason for this is the "youth" of the process. It is therefore essential that wholesalers arrange to sell the equipment of those manufacturers, who possess adequate and qualified manpower to help them to properly cultivate and serve all prospects in their territory, while sales and research activities on the part of the factory provide for continuous education of their sales force.

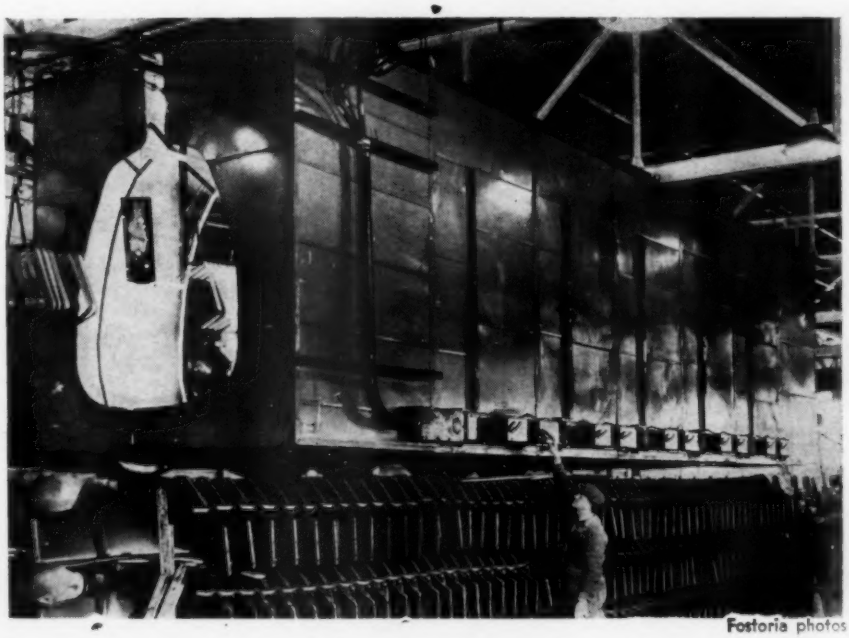
There is another large group of capable sales engineers along the road to market in the form of central station sales engineers, and the technical service men of the industrial finish manufacturers. In normal times they help to stage public demonstrations in behalf of the infra-red process, and have a laboratory set-up near at hand to work jointly with the wholesaler is serving the prospects and user continuously, as regards power and finish requirements. Obviously, all must work "hand-in-glove" so as to make certain that the best interests of the customer will prosper. These specifications have developed by close observation of the strong and weak points brought to light through everyday actual experiences, and are not in any sense mere theories.

As a final portion to this discussion on the sales of infra-red equipment, there are seven distinct and separate steps, no one of which should be omitted, because they will facilitate the closing of a sale promptly and with the least expenditure of time by the Sales Engineer and the Buyer. In logical order these steps are:

1. Demonstration of the Process
2. Presentation of Use Evidence
3. Actual application testing
4. Calculation of equipment required
5. Proposal and Quotation
6. Installation supervision
7. Guidance and service in operation

"Seeing is believing"—and by the engineered sales approach the prospect is quickly acquainted with what you ask him to think and talk about.

* *Manager, Infra-red Equipment Sales, Fostoria Pressed Steel Corp., Fostoria, Ohio*



Fostoria photos

Another view of the infra-red oven shows that the sales engineer had to solve a hanging problem. He designed roof trusses for stress loads as well as supervising the entire installation.

Model War-time Lighting Sets Lighting's Peacetime Standards

Curtis Lighting, Inc., photo

Westinghouse Lighting Division photo

Day Brite Lighting, Inc., photo

Good wartime installations like these—in a radio-set factory, above left—in a metal fabricating plant, above—and in a machine shop, left—are hastening victory by saving man-hours, increasing efficiency, and decreasing waste. And they are setting a pattern for industrial lighting for the competitive business world of tomorrow.

A continuous row installation of fluorescent lighting in the world's largest bomber factory—an example of good wartime lighting that is paving the way for peacetime standards.

The men and women who are working today in the well-lighted offices, drafting and inspection rooms of war industry, such as the four below, are going to want office, store and home lighting of equal quality after the war.

Guth Company photo

Sylvania Electric Products photo

General Electric Lamp Dept. photo

Miller Company photo

Sylvania Electric Products Inc., photo

Benjamin Elec. Mfg. Co. photo

Guth Company photo

Sylvania Electric Products Inc., photo

Westinghouse photo

In every case, better lighting that is helping speed the needs of war, and at the same time, proving the need of universal relighting to war-time standards. Top, left, fluorescent lamp parts are made and inspected under this continuous row lighting. Top, right, final assembly and inspection at an instrument factory employs fluorescent units to supplement a general incandescent installation. Center, left, this industrial tool plant needed horizontal as well as vertical illumination. Center, right, high intensities for precision tool and die work. Left, more than 25 footcandles of general illumination in this machine shop.

O.E.M. photo

This incandescent installation in the drafting room of one of the world's largest aircraft factories helps relieve the problem of eyestrain and fatigue for these engineers.

Curtis Lighting, Inc., photo

More than 30 footcandles of light in this machine shop. Machinists will never again willingly permit the bare-bulb-in-a-hanging-socket that "lighted" many pre-war shops.

With lighting designed to the individual job, its full versatility is being used in war work and being pre-tested for peacetime developments. In the two photos below, applications of localized light as a supplement to general lighting to provide extra high intensities for critical seeing tasks. This is valuable when workers are under wartime conditions of speed and long hours.

Westinghouse photo.

Fostoria Pressed Steel Co. photo

Forecasting the Lighting of the Future—

Where the Wholesalers Fit, In

By E. D. Stryker*

THIS is the heyday for drafting board dreams! Everyone but the automobile manufacturer is designing the motor car of the future. Encouraged by preliminary surveys of pent-up demand, all sorts of people are planning post-war electrical appliances, pre-fabricated housing, new forms of rail and air transportation and a wide variety of other similar improvements upon the world in general.

Already peep-show previews are everywhere around us. All of these new ideas, despite the fact that they may never reach realization, are interesting, exciting, stimulating and can be resultful.

But, in the words of the old negro spiritual, "Everybody who talks about heaven ain't going there." Only the men who work their drafting board dreams through the laboratory and into the field are going to be ready to put on their golden slippers and fly all over the post-war heaven.

Fortunately, for the future of lighting, practical men are now engaged in evolving, perfecting and pre-testing practical plans. Because they have had a big stake in the past, they are driving for a big stake in the future.

As little a time ago as 1942, lighting fixture manufacturers had attained an amazing annual volume figuring into millions of dollars. Even after war had necessitated the diversion of critical materials to other uses, around-the-clock war production and essential office and commercial replacements held that

volume at a high rate and at a total far greater than anything that had ever been reached in any period prior to war.

The impressive figures of past performance reflect the motive for the kind of post-war planning that is now being done, the planning of practical men who recognize the changes that war has brought and can assay the changes that peace will bring.

These men believe that a hundred million dollar market awaits the return of peace-time manufacturing. They say, and our own experience tends to confirm the forecast, that the war-starved commercial field will be a larger market than the industrial plants which will be re-converted at the end of the war, although the lighting standards found to be so efficient in war will carry over into civilian manufacture.

The approach to post-war markets will be somewhat different than that to which our electrical wholesalers have been accustomed during the long months of war. New volume will come, not from relatively few large installations but from a multitude of small ones, jobs of ten, twenty and up to one hundred fixtures. Design will tend to be more completely functional and less ornamental, both in the industrial and the commercial markets.

The lighting equipment of the future is certain to be even more largely fluorescent than ever before. On new lighting or the relighting of all interiors, post-war, the demand for fixtures will tend toward flush-mounting and with war experience as a guide, a high percentage of continuous row or large area installations will be made. In most new buildings recessed or flush-mounted fixtures will distribute cool, soft, even light on working surfaces.

Even before the war, the beginning of a trend toward large area light sources was evident in the domestic market and the post-war residential field will be far more important. Even now, powerful new war born trends are operating to work drastic changes in domestic buying attitudes and habits.

Millions of men and women now working in war factories are getting first-hand information, learning

Future Selling of Lighting Equipment

the true value of lighting recommended by lighting specialists. Every day in war plants all over the country, they are seeing for themselves what lighting can do for them as individuals. Many of them are working under lighting that has been correctly applied in units from five to a hundred times as effective as anything they had ever previously experienced indoors.

And in all of these plants, the workers benefitted by fluorescent lighting can see for themselves the difference that it makes, see how it increases their accuracy, reduces strain and fatigue. When they return to their homes, these workers are becoming increasingly aware of the inadequacy and the inefficiency of present home lighting.

When the war is over and these people are at home for longer hours, they are quite likely to expect and demand more from lighting than ever before. Millions of people in industry, in the armed forces and even in homemaking are being subjected to a degree of technical training that they might never have experienced in normal times.

Technical training stimulates curiosity, teaches discrimination between fact and fiction, and generates a desire to know why and how. With the return of peace, these men and women will be far more receptive to lighting as a science and have a far clearer understanding of what they want and need than we could have given them in any way by our own unaided efforts.

New home builders are almost

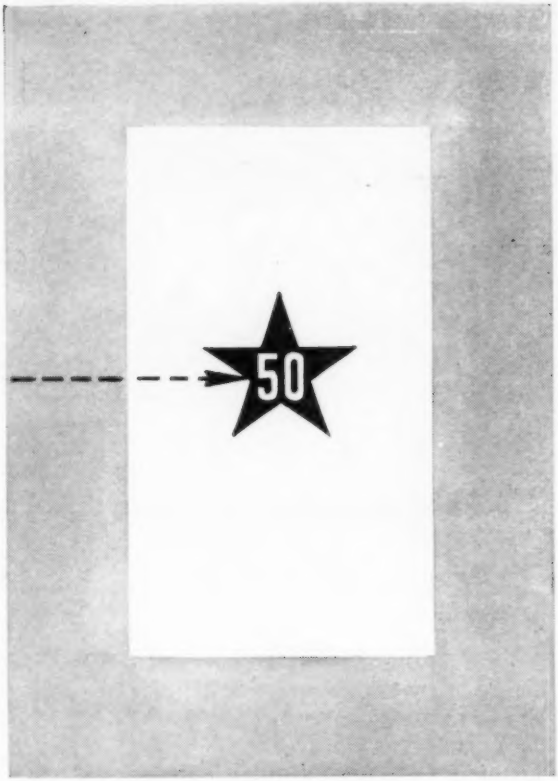
The wartime association of industrial workers with good lighting will be reflected in their future demand for it in homes.

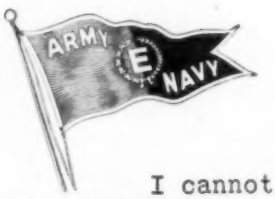
In the future, better functional design will aid architects to construct with light, help men to create with light.

an open letter

to

WIREMOLD men in the service...





Hartford, Connecticut

I cannot tell you how much personal satisfaction it gives me to report to you that your Company has been awarded the Army-Navy E for excellence in the production of the materials you need to fight with.

The men and women you worked with have earned this award by putting every ounce of their energy, and then some, into their particular jobs. Our part is a small one compared to the one all of you are playing, but in this man's war, every wheel must turn constantly and fast.

We can honestly say that one of the most important factors in spurring us on to the kind of effort we have achieved is our thoughts of those of you who have left to go into the armed forces. The work that has brought this Award is about the only way we have of telling you that we're in the outfield backing you up. You have our pledge that we will continue to do so.

Best of luck from all of us.

THE WIREMOLD COMPANY

D. Hayes Murphy

President

P.S. We are continually increasing our purchase of War Bonds, too.

WIREMOLD Makers of Textile Webbing and Metal Precision Parts for the Army and Navy.

Both manufacturers and consumers are getting new ideas for post-war home lighting from good industrial installations. General Electric photos.

certain to use fluorescent, in bathrooms, kitchen, laundries and, to some extent, in all other rooms. The men who plan pre-fabricated homes undoubtedly will utilize recessed fluorescent fixtures in utility rooms and more decorative equipment in living rooms.

Although already there are indications of the need for literally thousands of new post-war homes, the relighting market will still remain as the largest and most promising domestic market. Relighting bathrooms, kitchen and basement rooms will constitute the preponderance of this new fluorescent market although portable lamps will come back quickly and in considerable volume.

These, then, are the phases of the market of the future for the lighting wholesaler. Each of the three markets, industrial, commercial and domestic, is very important and justifies serious consideration. In their post-war planning, electrical wholesalers must also be conscious of some of the other forces now at work, forces that may seriously affect both their market planning and the markets themselves.

Old-line fixtures makers, men who both before and during the war have performed a Trojan task in the design and manufacture of fluorescent fixtures seem most likely to continue to maintain their position of leadership in the industry.

Nevertheless, literally hundreds of new "manufacturers" will enter the fluorescent field. Men with an accumulation of enforced savings already are looking at this new green pasture with eager eyes and will get into it as soon as materials and manpower become available. Some of them will survive. Many of them, although they may not last long, may cause considerable confusion during the time that they are in business.

Sales technique and distribution likewise will be effected. The fact that much of the commercial volume will be represented in a large number of small unit sales can result in the same type of door-to-door demonstration that was characteristic in the early days of fluorescent lamp and fixture marketing. A large percentage of the new manufacturers, unable to secure adequate distribution, will solicit door-to-door, hang demonstrators, perhaps make their own installations and confusion cannot help but result.

Because this small unit market will constitute a large total of potential sales, old line electrical manufacturers and wholesalers may have to employ new techniques, perhaps evolve a co-operative utility selling plan or organize resale crews and employ other similar selling methods.

Financing, too, may be a factor and the contractor-dealer should be equipped to fit into this new set-up. Wherever he can sell and install the small neighborhood commercial jobs, whenever he can fit fluorescent to the needs of the builder of new homes or establish himself as an expert in the relighting of old homes, the contractor-dealer fits into the electrical wholesaler's plan for post-war market development.

As we said in the beginning, all the people who talk about heaven aren't going there. Only the electrical wholesalers who have made sound plans, established new avenues of distribution and are set to go when the war ends will put on their golden shoes in the post-war market.

A present connection with the manufacturers of certified fixtures is bound to help because certification long since has removed many of the uncertainties.

Already in existence, both in the industrial and commercial fields, are groups of fixture makers who manufacture and distribute certified equipment. Even before the war, these manufacturers had established self-imposed checks on an imposing number of basic standards for the safety, performance and electrical excellence of commercial as well as industrial fixtures.

All present signs indicate that the post-war lighting market is worth all of the consideration that we now have time to give it. First, there will be a new lighting market, at least as large as that of 1942. Second, conditions affecting the manufacturing and marketing will be different and at first confusing, so new plans are indicated. Third, everyone in the lighting industry *needs now* to try to analyze his post-war status and prepare for tremendous new demand.

**The General Electric Company*
Nela Park, Ohio

CHASE plastic lighting fixtures now supplied by WAKEFIELD*

*For the duration

Here's a Wartime Change:

. . . that fits WPB suggestions on more efficient use of manuufacturing facilities.

. . . that helps former Chase lighting distributors serve you better.

. . . that gives you wider style choice in good lighting units to help speed essential work in war plant offices.

Like the COMMODORE, the COMMANDER is tops in lighting efficiency . . . over 86% of the light from the bare bulb, according to Electrical Testing Laboratories.

It provides good indirect light distribution . . . engineered to put light where you need it. And it is pleasing quality light that blends with the ceiling . . no "black spots".

The COMMANDER's light weight Plaskon shade is easy and safe to handle and clean . . . an important factor which may mean less interruption of wartime paperwork. Surface brightness is low . . which helps protect eyes from glare and strain.

The COMMANDER is now available in both "close-up" ceiling units and suspension type. For full details on this plastic lighting unit that can help you speed your paperwork, write us.

★ ★ ★

For outstanding war production . . . made possible through the untiring efforts of our men and women who make equipment which has helped save fighting ships and men.

ARMY (E) NAVY

SUPPORT OUR FIGHTERS . . . SUPPORT THE 3RD VICTORY LOAN . . . **BUY WAR BONDS**

THE F. W. Wakefield BRASS COMPANY

RED ● SPOT LIGHTING FOR COMBAT OPERATIONS AND WAR PRODUCTION

VERMILION, OHIO

What Will Be the Trends In Selling Lighting Equipment

A Symposium

Sell the Idea of Good Lighting

By D. A. Marsden

Sales Director, Champion Lamp Works
Lynn, Massachusetts

The idea of good lighting has received tremendous impetus in the last few years. Developments just prior to Pearl Harbor opened a new and broader understanding of the need of good adequate lighting of higher intensities. Actual experience in war plants and defense industries since Pearl Harbor have proven its advantages. All of this constitutes progress for the lighting industry and also for those people who are going to have the advantages of better lighting after the war is won. We know more about good lighting ourselves and should be able to offer more to them.

At the present time there are people who have the idea of better lighting and are building up a want for the better lighting that they know they should have but cannot get now. Before the war is over there will be many more who will want to buy better lighting and this will be a big market.

Lamp manufacturers and particularly fixture manufacturers at the present time are laying plans for going after this post-war market. The question might well now be asked, "How will they go after it?". Will the industry be so hungry for business after their long hibernation, due to curtailments, that their only interest will be for the order with no interest or regard for the idea that made that order possible? Are we going to go back again to the days when fluorescent fixtures were sold by peddlers with little or no knowledge of lighting, and whose only appeal was one of price?

If this is allowed to happen it would appear to me that the lighting industry will be set back years—much progress will be lost—the buyers will be cheated out of what they will be trying to buy—and last but not least, the industry will cheat themselves out of many thousands of dollars worth of sales that they might have secured if they attempted to support the idea of better lighting first and make the order secondary to the idea.

•

Unsurpassed Sales Volume Lies Ahead— Sell Lighting, Not Just Fixtures

By Russell L. Test

Manager, Lighting Division
Corning Glass Works
Charleroi, Pennsylvania

In the post-war period, lamps and lighting equipment can enter an era of unsurpassed sales volume.

That they will enter such an era depends upon—

1. Careful products engineering
2. Attractive product design
3. Efficiency of product
4. Fair price for product

Stores and other types of civilian commercial buildings, will be ready for relighting.

Old buildings will install air conditioning, thus lower ceilings will be built in to accommodate necessary equipment.

Homes will be relighted, but not with gaudy equipment which has only a low price to recommend it.

The demand for fluorescent lighting will resume its interrupted course with ever growing volume. New and unusual types will unquestionably make their appearance.

Make a careful survey of post-war lighting problem abilities in your area. Plan your selling campaign as far in advance as possible. Sell "lighting" rather than so called "fixtures."

•

First Five Post-War Years Will Be the Best the Lighting Industry Ever Knew

By G. T. Morrow

Acting General Manager, Curtis Lighting, Inc.
Chicago, Ill.

At Curtis Lighting we look for a great expansion in lighting sales as soon as peace is declared.

We know from our own contacts that there is now building up a tremendous backlog of potential orders for commercial lighting equipment and we expect the expansion of this market to be well under way before there is any substantial flow of post-war consumer goods.

Post-war business should move chiefly through the regular trade channels, and the old line lighting manufacturers who have maintained their distribution setup throughout the war period should be in an excellent position to get a lion's share of the orders.

Most commercial establishments and office buildings have a regular modernization program of which lighting is an essential part, and the desire to convert to fluorescent lighting, where this has not yet been done, will provide a tremendous push.

Progressive forces have urged the inauguration of a program of education of the entire industry to a more professional understanding of the fundamental problems of lighting and seeing. We expect this to be done. To accomplish the best results this program should reach not only the lighting specialist but everyone connected with selling or recommending lighting equipment. As the fluorescent lighting art becomes more mature, and as we get farther and farther away from primitive bare lamp fixtures, this educational program will become progressively more necessary.

Naturally, the stimulus of new products and designs will play an important role in the post-war lighting business as will the better standards of illumination exemplified by the great new war plants.

We see no reason why the first five post-war years should not be the best the industry has ever known.

•

A Tremendous Market Is in the Making But Salesmen Must Know How to Sell

By D. J. Biller

DayBrite Lighting, Inc.
St. Louis, Missouri

At this particular time we visualize a tremendous post-war lighting business in all branches of the lighting industry—residential—commercial — industrial — streetlighting, and specialties of all kinds. The advancement of lighting in the last two years in war industries has been so great as to make even the best pre-war lighting installations inadequate.

Due to the war program and the shortage of critical materials, the regular market for lighting has been elimi-

nated. This market of natural business, plus the extra stimulus of fluorescent lighting, plus new lighting standards will produce the largest lighting business in history. In the rush to buy immediately after the war, anything

that looks like a lighting fixture will find an easy market, but it will not be long thereafter before the buyer will insist on quality merchandise sold by reputable concerns with an honest sales policy.

The original glamour of fluorescent lighting will be replaced by demand for better merchandise with more eye-appeal, performance and with thought to the cost of maintenance. The salesman will recapture his profession and the lowest selling price will not always get the order.

I would recommend that each salesman of lighting equipment thoroughly learn his business now so that he will be ably fitted to do an intelligent selling job in the post-war period. The lighting specialist must know his business as thoroughly as any other professional man. He must be in a position to diagnose the lighting problem and prescribe the proper treatment.

With the lighting boom we anticipate after the war, the market will be flooded with fly-by-nite manufacturers and salesmen whose main objective will be to make a sale. It will be our job to guard our progress and to see that it is properly expanded.

•

Good Light—a Vital Production Tool—Sales Opportunities Excellent—If You Take Them

By C. W. McDaniel

Vice President, Director of Public Relations,
The Fostoria Pressed Steel Corporation
Fostoria, Ohio

Sales of industrial lighting equipment have increased substantially during the past couple of years because of the growing recognition of the important contribution good lighting makes to better and faster production. That good lighting is a vital production tool, is no longer speculation.

In this connection it is significant that employers in increasingly larger numbers are concerned with the necessity to provide each worker the kind and type of lighting needed to enable that each see what he must see to do his job easily, quickly, safely, and in comfort. This is true particularly where critical work areas exist.

Such recognition is bound to be beneficial to the industrial lighting equipment industry, now, and in the future, if the latter takes advantage of the opportunity it affords.

•

NOW Is None Too Soon For Looking At Peace-Time Markets and Laying Plans for Peace-time Selling

By H. Freeman Barnes

Manager, Sales Promotion Department
Lamp Department
General Electric Company
Nela Park, Cleveland, Ohio

The war news is good—and irrespective of whatever reverses we may encounter, victory is much closer than we had dared hope a short while ago.

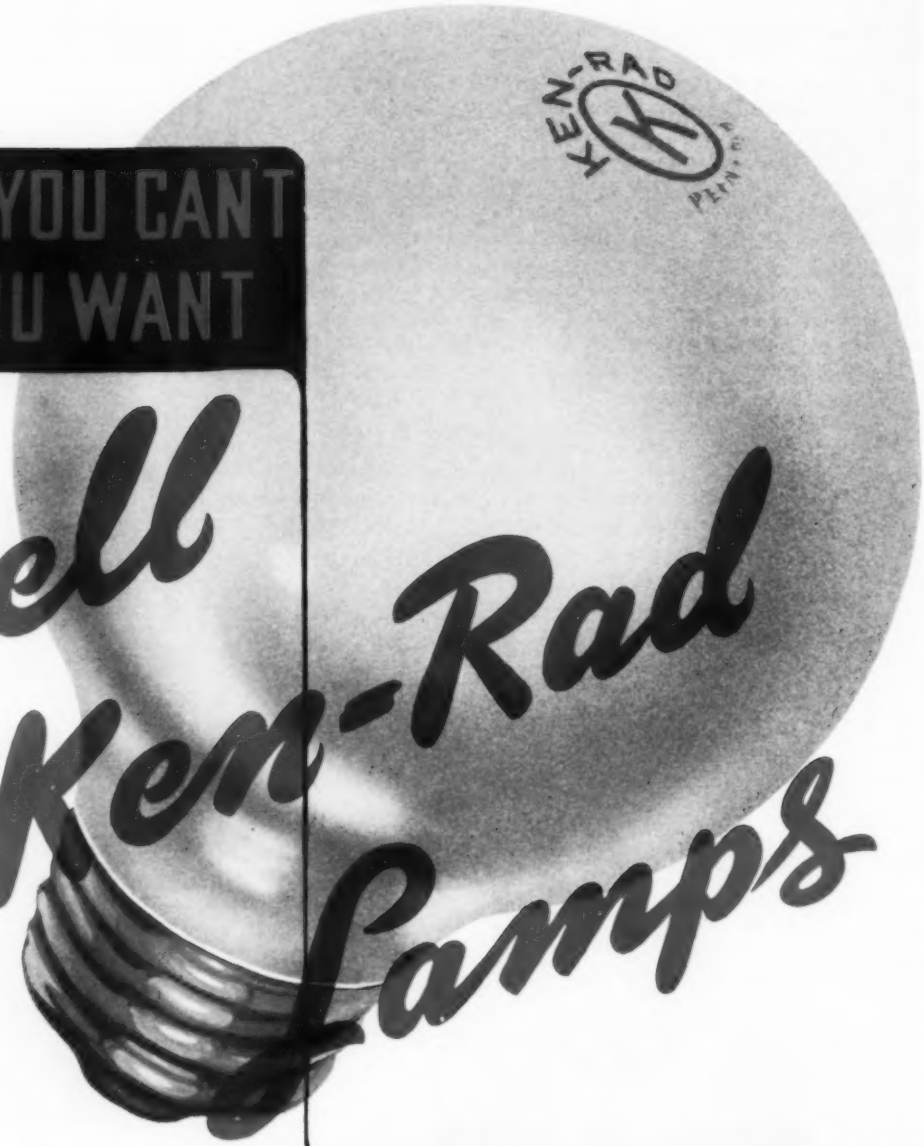
This means that the opening up of materials for civilian goods is just around the corner. This means that the manufacture of lighting equipment for stores, offices, schools and homes is not too far in the future . . . . maybe in limited quantities at first but, in any event, now is none too soon to be looking at peace-time markets—and laying plans for peace-time selling.

Because nine out of ten lighting fixtures in use at present, in fields other than industrial, are or will be obsolete, the market possibilities are enormous. Industry can figure on a volume double that of the late 30's—if advertising, promotion and selling are geared to the possibilities of the markets rather than designed solely as competitive weapons.

The industry may stand at the crossroads . . come peace . . one road is labeled SELLING UP, the other is labeled SELLING DOWN. If we can sell lighting fixtures and lamps on the basis of doing a lighting job; if our salesmen are trained to sell lighting and the results and benefits of proper lighting, business will be good for many, many years.

If, on the other hand, industry takes the other road and offers for sale . . and uses those sales methods which inevitably result in "selling at the lowest price irrespective of quality or lighting results" . . business will be good

EVEN WHEN YOU CAN'T GET ALL YOU WANT



Sell Ken-Rad Lamps

● Ken-Rad is both proud and sorry that we are unable to meet your demands for present day deliveries proud that we maintain quality in materials and workmanship that pass painstaking government inspection and approval for direct and indirect war efforts and sorry we are unable to fill the civilian needs of our jobbers and dealers

● After Victory you'll have plenty of Ken-Rad lamps to fully utilize your franchise and again develop an attractive and profitable market

KEN-RAD

TRANSMITTING TUBES
CATHODE RAY TUBES
INCANDESCENT LAMPS
FLUORESCENT LAMPS
METAL AND VHF TUBES
SPECIAL PURPOSE TUBES

OWENSBORO KENTUCKY
U S A

KEN-RAD TUBE & LAMP CORPORATION
OWENSBORO KENTUCKY U S A

for a year or two . . . but maybe mighty sick for years thereafter.

If the lighting industry is interested in doing its share of creating jobs in its manufacturing plants, in its sales organizations, and jobs for electrical contractors, carpenters, decorators, painters, etc., they will refuse to sell lighting short. And in SELLING UP, they will not only create more jobs than have ever been available before—but everyone all around will make more money.

•

Future Holds Promise of Steady And Permanently Expanding Market

By W. M. Goodrich

President, Goodrich Electric Company
Chicago, Illinois

Replying to your letter of July 2nd, the feeling of those in the trade with whom I am in contact is one of grateful expectancy for that time in the near future when a selling rather than a delivery job will be necessary.

The future, of course, holds much promise for those aggressive organizations which have kept their identity and have not lost their perspective at a time when orders were plentiful and deliveries very difficult.

With the advanced levels of illumination now commonly accepted by American industry, it is my opinion that a steady and permanently expanding market is in prospect for lamps and lighting equipment.

•

Don't Ever "Sell" The Lighting Industry "Short," Least of All: NOT NOW

By Edwin F. Guth

Edwin F. Guth Company
St. Louis, Missouri

After spending over forty years as a manufacturer of lighting equipment, I am still of the same opinion as I was forty years ago when I entered it, namely: The lighting field is the most fascinating that the electrical industry offers and at the same time it holds the most promising future.

I do not share the view of those who feel that the end of the fighting will bring a decline in sales because of the tremendous volume of equipment for war production, that the lighting industry has had the privilege of furnishing.

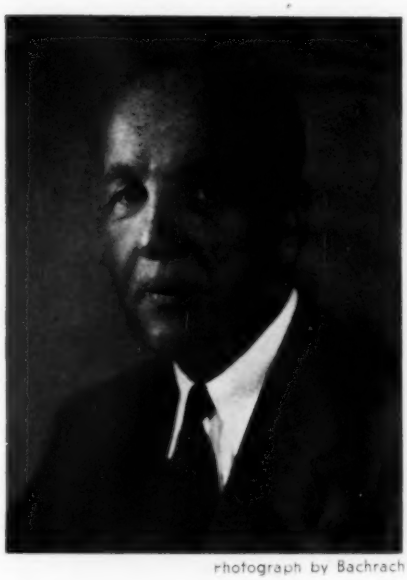
To the contrary every official and every worker who has been active in a war plant having modern lighting intensities, will turn into a missionary and salesman for better lighting—not only in the factories or offices where they may work hereafter but in their own homes and in the stores where they do their shopping.

Those millions of salesmen and women will notice poorly lighted places wherever they find them and what they will say to those responsible will have great weight and influence.

Once the materials are available, those hundreds of thousands of retailers who now have bulging bank accounts will be eager to make their stores and show windows fine examples of modern high intensity illumination. The millions of workers who have been earning high wages and are accumulating large backlogs of buying money—in banks, savings accounts and war bonds—will want to buy the most up-to-date lighting they can get and will have the money to pay for it.

I think we will experience a period of greater prosperity than we have ever seen.—I, for one don't ever "sell" the lighting industry "short."

•



photograph by Bachrach

Sell "Relighting" For Safety Salesmanship Is Service With Several New Twists

By A. D. Cameron

Vice President, Holophane Company, Inc.
New York, New York

In the immediate future and perhaps for the duration, the lighting market will really be "relighting." The pro-

gram of new construction is apparently nearing completion. There will be minor additions but in general, the lighting industry faces a prospect which is largely confined to relighting older existing plants.

In approaching this new situation the wholesaler's salesman will have to revise his selling points and recognize his obstacles because this new market is completely different.

His selling points are SAFETY and CONSERVATION. Increased production is no longer a potent argument for better lighting. The present rates of production are generally adequate. The shortages of man power and materials are the present "bottleneck." Anything which contributes to the reduction in industrial accidents is of tremendous interest.. There can be no certainty of safety without adequate vision.

Conservation of critical materials is the other selling point for good lighting. Spoilage must be reduced and every pound of controlled materials must go into tanks, planes, guns and ships, and not into the scrap pile. Good lighting means better workmanship, and better utilization of precious materials.

The obstacles to be overcome consist of WPB regulations and restrictions. Many of the materials required in lighting systems are critical. When the wholesaler's salesman has found an older plant which needs better lighting, he should be thoroughly familiar with the procedure for filling out the PDIA application for a priority rating. To this must be attached the supplementary sheet containing all the lighting and electrical data as well as the layout of the new wiring system with the exact location of outlets. The sale is not completed until the priority is granted.

•

Many Small Plants Are Ready NOW For More or Improved Lighting— They Have Priority Rating Too

By Fred J. Buchal

Leader Electric Manufacturing Corporation
Chicago, Illinois

The future for industrial fluorescent lighting looks brighter than ever. The new units manufactured now with less steel makes for streamlined appearance with maximum light output and easier maintenance.

Many small plants having 10 to 50 employees are potential customers for improved lighting *now!* Their war contracts give them high enough priority ratings to obtain this new improved lighting. It is amazing the number of plants that have not been touched. A little more effort in contacting such factories will bring surprising results.

Industries now affected by the present world-wide conflict are making plans for the post-war era. Their ideas regarding expansion, reconstruction and rehabilitation will run into the hundred of millions of dollars. What a market will unfold before us when the war is over. All of us should lay our plans *now* for this business.

It goes without saying that the more fixtures sold, more lamp replacements will be necessary, which business is very profitable.

•

When the Lights Go On Again— All Over the World— They'll Be Fluorescent

By Harry M. Burt

Lloyd Products Company
Providence, Rhode Island

In my opinion the fluorescent industry has had the greatest proving ground of any infant industry in history.

Largely to supply the urgent demands of the direct war effort, reliable statistics tell us that over 30,000,000 fluorescent light outlets have been installed in the unbelievably short period of a few years.

With the wonderfully planned post-war developments now ready for presentation to the field and with over 30,000,000 seeds planted in the fertile soil of the American market, it does not take a mental giant to foresee what the post-war harvest will be.

The wise fluorescent manufacturer, now doing vital war work as well as producing his regular product, is the one who has left himself in a position to immediately convert his expanded facilities into the immediate production of his regular line.

Let us first win the war and then "When the lights go on again all over the World," they will be fluorescent.

•

New War Plants Have Set the Pace In High Intensities. Future Sales Potentials Stagger the Imagination

By B. A. Mitchell

Mitchell Manufacturing Company
Chicago, Illinois

Industrial lighting is a commodity whose demand is in direct relation to the amount of industrial activity existing in the country. So long as the wheels of industry turn, so long will the demand for lighting equipment exist, and the faster they turn, the greater the increase in the amount of equipment needed.

Right now, industry is moving at breakneck speed. Assembly and production facilities are not only being expanded, but are constantly re-shifted and changed. All these moves necessitate a change in lighting equipment, in most cases involving the purchase of new or additional fixtures.

There is in certain places a tendency to think that since

most of the big monumental war plants already have been constructed and the lighting equipment purchased, there remains only some small "leavings." I do not believe this is the fact.

Very seldom does a plant's production set-up remain

static. There are always changes, expansions, additional or revised working facilities, which involve in nearly every case purchase of new lighting equipment. I know of one completed war plant which purchases regularly from 100 to 300 fluorescent fixtures per month just to keep up with the constant changes in their operating set-up.

The new, large, recently constructed war plants, with their efficient lighting systems, have set a pace for existing plants to follow in the immediate future. It will take hundreds of thousands of fixtures to relight existing plants to anywhere near the lighting standards of newly constructed plants. This relighting is going on now, every day. The alert lighting salesman going out for this business today is getting it.

Thus the immediate future in industrial lighting may be viewed with reasonable optimism and assurance. When the war ends, as it some day must, the lighting potentialities in the industrial, commercial, and residential fields will be so gigantic as to stagger the imagination, and the electrical wholesaler will face the greatest opportunity in the history of lighting.

•

To Sell Better Lighting RIGHT NOW— Here Are the Major "Ground Rules"

By Alfred A. Overbagh

Overbagh & Ayres Mfg. Co.
Chicago, Illinois

Electrical wholesalers are finding it necessary to spread their salesmen pretty thin in order to properly cover the territory. Time and effort can be saved in the sale of lighting equipment by becoming thoroughly familiar with the restrictions and proper procedure under WPB limitation orders L-78 (fluorescent) and L-212 (incandescent), and the Design Guide for Interior Electric Lighting and Wiring for War-Time Construction.

Lighting equipment may be sold on rated orders of A-1-j or better but these ratings are only given for highly essential locations. Salesmen calling on strictly civilian enterprizes are looking to the future and not for immediate orders, as critical materials which are necessary in the manufacture of lighting equipment are not being allotted to the manufacturer for civilian needs.

Good lighting is recognized as a useful tool and high foot-candle intensities should be recommended for increased production. In laying out new or additional lighting installations, follow the American Bureau of Standards' recommended foot-candle levels and the Design Guide as they will generally be accepted by WPB in their analysis of lighting applications. A new lighting installation to replace an old one should show a considerable increase in footcandles in order to justify the granting of a rating. New designs just for a change have no place in wartime and is wasteful of materials. Properly designed fixtures using a minimum of materials and producing a maximum light output is the order of the day.

Both incandescent and fluorescent lighting have a place —sell the right type for the right space. Save man hours and materials by new lighting installations in important areas.

•

To Get the Most Sales, In Present And Post-War Markets: Practice and Teach Sound, Intelligent Selling

By A. H. Manwaring

Manager of Sales, Philadelphia Electrical & Manufacturing Co.
Philadelphia, Pennsylvania

The future of lighting equipment and lamp sales breaks itself into two divisions, the immediate and the post-war.

The immediate future is concerned with either new construction or the rehabilitation of old plants for new war production. The Government, taking the most logical step to eliminate as far as possible the unnecessary use of critical building materials, has regulated new construction, and contracts for this work are falling off steadily at the present, consisting largely of hospitals and prison camps.

With the need for increased production still facing the country, the reconditioning of old plants for new war production is still the largest market available for the lighting equipment salesman. This means that the market for industrial and exterior lighting manufacturers remains intact although reduced to a certain extent due to the fact

that the revamped plant construction cannot take up the entire slack.

To predict what type of equipment will be available after Victory is difficult. It seems logical, however, to believe that immediately following the war, equipment will not undergo too radical a change. Dies, patterns, moulds, etc., have not been discarded. New ones cannot be built overnight. Development has, of necessity, been curtailed.

This does not mean, however, that there will not be a time in the post-war future when the discoveries of the war era concerning new materials, new uses for old materials and new processes, will be an important factor in the science of lighting.

To that end manufacturers, wholesalers, contractors and utilities should organize themselves now for post-war planning. Unless this is done we will find ourselves plunged into the complexities of post-war manufacturing and merchandising without time for education. In Philadelphia an effort is being made in this direction.

First, lighting practice schools are being inaugurated to acquaint the contractor, wholesaler and utility man with the fundamentals of lighting procedure. A three months course has been introduced which meets once a week, the classes being conducted by members of the Illuminating Engineering Society. Much is being learned at these meetings, which, following the war, will permit a better understanding of lighting practice and pave the way for the developments of the future. This will undoubtedly promote intelligent selling and be of benefit to the entire lighting industry.

Second, plans are being introduced for the education of the public to better lighting following the war. This group work was most effective during prewar times and should prove more effective following the war.

Third, the group has inaugurated, through the cooperation of the Electrical Association, a "Maintenance Digest" registering the names of manufacturers having representatives or outlets in the immediate territory.

In this booklet are listed maintenance catalogs published by various manufacturers, and other pertinent information which will aid in maintaining equipment. This booklet has been forwarded to each known user of industrial lighting equipment in the Philadelphia area.

Finally, a general post-war planning committee has been developed composed of manufacturers, wholesalers, contractors and utility men. Their work is to formulate plans permitting a return to normal promotion with the least possible confusion.

Lighting equipment as well as lamps must be sold intelligently. Surely this can best be done through the knowledge of good lighting practice and the cooperation of the four groups—manufacturer, wholesaler, contractor and untility.

•

High-Intensity-Minded War Workers Will Speed Demand for Adequate Lighting

By J. G. Riesman

President, Royal Electric Company, Inc.
Pawtucket, Rhode Island

There is still a great necessity of adequate lighting, and many war plants and workers are suffering from lack of it—however, the worker who has had any experience in a plant that has been properly lighted makes it quite apparent to management when his new job is poorly illuminated.

Many hundreds of thousands of Americans have become acquainted with bright working conditions, so that when it will be possible again to obtain new and better lighting

conditions at home, they will never be satisfied with the comparative "kerosene lamp" era that existed there previously.

If you will recall the amazing demands of a comparative small number of the American public who, on a pre-Pearl Harbor basis, "mushroomed" the lighting industry capacities, you can visualize for yourself why the post-war "vacuum" of things electrical, particularly lamps and lighting equipment, will be enormous—and ones that the electrical wholesalers will find to be (excuse the pun) the "brightest" items that will light America to a happier and freer world.

•

Sell Only Certified or Approved Lines— When That Boom-Sized Backlog Of Lighting Orders Starts Rolling

By B. E. Spero

President, The Spero Electric Corporation
Cleveland, Ohio

The future of the Lighting Industry is as bright as the new lamps which will be offered to the public immediately after the war. While the introduction of the fluorescent tube created a revolution that gave the industry an impetus, it is my belief that post-war developments and new adaptations will carry our industry as far beyond the current fluorescent lights as fluorescent is beyond incandescent. Simplification of wiring and ballast, instantaneous lighting, the elimination of flicker, greater intensity, circular tubes —these are only a few of the changes that are sure to come.

Another factor that will help future sales is the large

backlog of requirements for new lighting equipment in markets which today do not have high enough priority ratings to purchase them. There should also be a boom in sales of fixtures especially designed for residential use. The many women working in fluorescent lighted factories and offices will want the same degree of illumination in their own homes.

The electrical wholesaler has done an outstanding job during the war. Because of the many new developments to be offered, and because of the large volume to be expected, the wholesaler will have the opportunity to strengthen his position in the merchandising picture. One word of caution: he should not neglect lighting—even though appliances may seem to offer more sensational profit opportunities.

For their own protection wholesalers should handle only approved lines of equipment, produced by responsible manufacturers.

•

Greatest Era of Demand Lies Ahead, BUT—Salesmen Must Qualify As Lighting Counsellors

By Don G. Mitchell

Vice President in Charge of Sales
Sylvania Electric Products, Inc.
New York, New York

There's little question in the minds of most men in the lighting industry that the post-war era will bring with it one of the greatest demands for improved lighting we have ever seen.

While it is true that the industrial market for lighting equipment in the past two years has seemed to mushroom out of all proportion, the fact remains that in the aggregate only a small percentage of industrial floor space is adequately lighted. Even this small percentage of well lighted

plants, however, has implanted in the minds of hundreds of thousands of war workers the value of good light. Under no circumstance will these workers be content to return to what might be termed "pre-war levels." In industry, offices, stores and homes there will, of necessity, be a constantly growing demand for better lighting.

It will be our task not only to devise efficient, useful and decorative light sources, but to see that these sources are properly used.

This means, then, that in the post-war market the salesman of lighting must be truly specialist—trained to an extremely high degree in his profession. He must be a lighting counsellor—fully capable of translating his prospect's needs into actual demands for his products, and proving just how *his* products can best meet the prospect's demands. He must be completely familiar with all sources of illumination—incandescent, cold cathode, fluorescent. He must have an understanding of color and its applications. He must appreciate the merchandising value of various types of lighting.

I am certain that only with this high degree of training can the lighting salesman be successful in what gives every indication of being really competitive market, where many, many items will be vying with each other for the consumer's dollar.

•

Golden Sales Opportunity Lies Ahead—With Wholesaler As Starting Point

By F. I. Wilson

Engineer Co-ordinator, F. W. Wakefield Brass Co.
Vermilion, Ohio

Today we in the lighting industry are faced with two problems.

First, to devote 100 percent of our time to the producing of war material and secondly, to accomplish through some miracle the mathematical impossibility of finding more than 100 percent of our time so that this addition can be devoted to planning for after the war. To us this planning concerns itself with the selling in the future of lamps and lighting equipment.

It means the maintaining of the principles of our present distribution system which has proven quite satisfactory in the past. No one can say just what details will be changed but all of our plans are based on the fundamental consideration that the electrical wholesaler will be the starting point.

From the electrical wholesaler of course we plan to

branch out through the related channels such as the contractor, dealer, power company and industrial. This means a constant check on all new forms of lighting equipment or suggested lighting equipment or lighting principles. In every case a close scrutiny must be made to see if the result obtainable will fit into the distribution channels mentioned above.

We look forward to radical changes in equipment as well as lighting requirements. The manufacturer who is not planning on assimilating such changes may find numerous additional problems to solve after the war is over. Any such problems that can be solved now and any plans which can be made now should be given every consideration. It appears to me that after the war is over there will be a golden opportunity for the sale of lamps and lighting and the manufacturer should be ready to take advantage of this opportunity.

•

What's Around the Bend For Lamps and Lighting Equipment

By W. R. "Bill" Freeman

General Sales Manager, Wabash Appliance Corp & Birdseye Elec. Corp., Subsidiary
Brooklyn, New York

The lighting manufacturer, wholesaler or dealer who seeks to translate his war experience into a practical post-war program is somewhat in the position of the saw-mill employee just "bitten" by a buzz-saw and trying ruefully to determine just which tooth did the job on him.

There can be no question that a great majority of those engaged in the lighting industry have been "bitten" in one form or another by the feverish, roaring, buzz-saw pace of World War II.

With the war's recent optimistic trend and peace seemingly nearer at hand than previously anticipated, there likewise can be no question that the wise manufacturer, wholesaler and dealer will start to think and act now in terms of what follows the Peace.

That peace-time market-to-be would seem to require the careful and intelligent consideration by every manufacturer, wholesaler and dealer of the following factors:

1. Product To Be
2. Customers To Be
3. Competitive Conditions To Be

Each of these naturally must be analyzed and interpreted in terms of one's own situation, but whatever the program devised it should take into account these likely post-war developments within the lighting field.

1. Further tremendous expansion of the war-accelerated public consciousness of the vital part that proper lighting plays in every feature of our daily lives.
2. Introduction of countless new lighting products and new techniques along with perfection of older products and methods in keeping this trend toward the better things in lighting.
3. Less tendency on the part of wholesalers and dealers to accept certain manufacturers' leadership position in "swallowing their lines whole" with consequent greater diversification of sources of supply and products handled.

•

Yes, all signs point to its being a brave and challenging new world in lighting, too, and the rewards reaped are sure to be in direct relation to the individual contribution that the manufacturer, the wholesaler, and the dealer makes to the cause of lighting progress. For Progress it is sure to be, and tomorrow's products, its handling and distribution are as likely to be as different from what we have known as yesterday's newspaper is from that of yesteryear.

•

Thoughtful Handling of Today's Problems Builds Prestige and Business Tomorrow

By H. E. Plishker

Advertising Manager, Lamp Division
Westinghouse Electric & Manufacturing Co.
Bloomfield, New Jersey

One of the greatest assets of a good salesman is optimism. A salesman who lacks this spirit of optimism is a fair weather salesman. He goes along fine when times are good but when the going gets tough he is lost. Without optimism he becomes panicky and instead of resourcefully approaching a problem he throws up his hands and lets the waves of indifference overcome him.

Today, more than ever before we need optimism to engender resourcefulness. Take the present day situation as it pertains to the lamp and lighting business. What is optimistic about that picture? If you look at it from the standpoint of available materials and merchandise to sell, there isn't very much and in all fairness I must tell you that we cannot see any signs of improvement. But, that is just one side of the picture.

There is another and definitely brighter side which many wholesaler's salesmen are overlooking. It is this. Lamps are still being made and distributed in restricted quantities. Lamp manufacturers allot their product to wholesalers on the basis of fixed percentages to previous years sales and with allowances for priority and non-priority orders.

Wholesalers must in turn allot their available supplies to their customers on the same basis. Every buyer of lamps realizes that there is a shortage of lamps and wants to get as many as possible.

Now here is where you as a salesman comes in. It is important that the available supply of lamps be distributed as widely and equitably as possible. War industries get first call, then other plants having lower priorities and finally a definite percentage must be given to retailers for sale to homes, offices, stores and all others on the home front.

Your house is trying to make this distribution fair and equitable to everyone. They want to treat everyone alike and show no partiality and favor to anyone. Your job in the face of this shortage is not to sell merchandise but to sell the fairness, honesty and integrity of your house. It takes optimism and resourcefulness to do it.

Customers are bound to complain when they don't get everything they ordered. You must meet these complaints —not by crying into the same towel but by showing them how your house is dealing fairly and squarely with everyone. If you will do that you will be doing a double-selling job.

You will be answering a present day complaint and you will be building prestige for the future. The day will again come when customers can choose their suppliers. They will remember with favor those companies who were fair and honest with them in these trying times.

# of Certified Fixtures
WARTIME PRODUCTION NEEDS

AND EFFICIENCY FOR THE FUTURE

These fixtures comply with WPB requirements and are made by manufacturers of E.T.L. Certified equipment. They are available on priorities for war plants that need them.

Hear the General Electric radio programs: The "Hour of Charm", Sunday, 10 p. m. EWT, NBC; "The World Today" news, every weekday, 6:45 p.m. EWT, CBS.

MADE TO STAY BRIGHTER LONGER

Starting with Edison's first successful incandescent lamp, General Electric scientists and engineers have constantly worked toward one goal . . . to make lamps that give more and more light for the current consumed and that sell for less and less money. G-E Mazda Fluorescent Lamps are made to stay brighter longer.

✶ *In process of certification when this advertisement goes to press.*

THIS COUNTRY'S FUTURE — BUY WAR BONDS

G-E MAZDA LAMPS

Key to the Future of Lighting Is the History of Its Past

By Dr. Woldemar A. Weyl

Professor of Glass Technology
Pennsylvania State College

THE history of the development of artificial light sources and that of artificial glass have much in common. Both reach back far into the early stages of civilization. The primitive man, who first seized a burning branch from an open fire to carry it into his cave, laid the foundation of the development which made us independent of daylight.

Modern illumination was made possible through the existence and use of glass. The cooperation between the two arts, however, was by no means one-sided. The ever-increasing demands on the qualities of glass gave the biggest impetus to its development. Already as a chimney, glass showed many serious shortcomings; it failed especially when subjected to unavoidable mechanical and thermal shocks. In order to harden the glass, two fundamental improvements were made, the tempered glass invented by De La Bastie in France and the compound glass, an invention of the German glass technologist, O. Schott.

Both inventions accomplished the same aim through entirely different methods. By quenching the hot glass in oil or by combining several layers of glasses having different coefficients of expansion, glass articles were obtained whose outer layer was under compression. This arrangements of internal stresses made the glass tougher and prevented failure under thermal shock. The old lamp chimneys by now are nearly forgotten but the glass industry still uses this toughening process in a large scale for plate glass, cooking utensils and eye-protective goggles.

So the development of lighting and glass goes on, one boosting the other. With the general use of the incandescent lamp there was a demand for an ever increasing number of glass bulbs which could only be met by replacing the old hand blowing process by an automatic one. Glasses had to be developed which could be melted in large quantities in a continuous tank, for one of the modern bulb blowing devices working day and night would make up to 700 bulbs in one minute. Such a machine has to be fed by a continuous stream of glass entering in the form of an endless ribbon.

Incandescent Lamps

In order to improve the efficiency of the incandescent lamp the temperature of the filament had to be raised, which in turn introduced new technical difficulties. One of the many difficulties which had to be overcome consisted in the fact that at higher temperature glass loses its insulating properties and becomes a conductor itself. Glasses with improved electrical properties were the result. The higher filament temperatures also produce glare and consequently a method had to be developed to frost the inside of the lamp without impairing its strength.

Now frosted lamps are available which give desirable light diffusion and absorb only a negligible amount of the light. For still better diffusion the powerful incandescent lamps were combined with lighting fixtures consisting of opal glass. This type of glass does not owe its diffusion power to surface roughness but to a multitude of fine crystals which form in the molten glass upon cooling.

One of the most difficult problems in the production of powerful lamps was the glass-to-metal seal. Ever since the invention of Edison, the lead-in wire had to be made of metals having about the same thermal expension as the glass used for the bulb. Most suitable metals have a relatively high thermal expansion which made it impossible to use glasses of the Pyrex brand type which otherwise would have been selected for their superior properties.

About ten years ago, with the invention of the bipost lamp it became unnecessary to match the expansion of glass and metal. The new construction provided a glass-to-metal seal by fusing a metal thimble or ferrule into the glass, the edge of the ferrule being tapered to give flexibility. This flexibility of the metal part prevents the formation of dangerous stresses between metal and glass and made it possible to use glass enclosures of low thermal expansion and high softening points.

The value of this construction for the development of modern illumination can be easily judged from the fact that starting with the 1940 models, almost all cars were equipped with an entirely new type of headlamp, the sealed beam lamp. This development, which was made possi-

ble only through an improved glass-to-metal seal, can be considered another milestone in the steady progress of illumination.

So far, we have discussed the mechanical properties of glass, its working characteristic and expansion which brought about important changes in the development of light sources. There are, however, two other groups of properties of equal importance: the optical properties, especially the light transmission of the glass; and the chemical properties, especially the resistivity to certain gases and vapors.

So long as the incandescent lamp was merely a convenient source of visible light, it was obviously sufficient when the glass enclosure was colorless. More recently, however, the interest grew in the adjoining parts of the spectrum in the infra-red radiation as well as in the ultra-violet. Now the glass enclosure had to be transparent in these spectral regions too.

The infra-red radiation was found to be not only useful for medical purposes but gained widespread application in industry. We are still in the beginning of an era where drying lamps will be generally used, but the use of infra-red light sources promises a tremendous saving in time for many industrial operations especially for drying of enamel paints and lacquers.

This infra-red is obtained by means of lamps which resemble the ordinary tungsten filament lamp but which are operated at abnormally low temperature. Under these conditions their light efficiency becomes very low, for practically the total electric energy is transformed into radiant heat. The low operating temperature, on the other hand, increases the economy of this method as it lengthens the lifetime of the lamp. Most glasses show sufficient infra-red transmission, especially if care is taken to keep out impurities such as iron.

From the viewpoint of glass technology, no major difficulties were introduced through the demand for infra-red radiators and drying lamps. The same cannot be said for the ultra-violet producing light sources, which often call for glasses with extreme properties so far as chemical resistivity, s o f t e n i n g point, and transmission are concerned. In order to meet all these demands other valuable properties such as good workability often had to be sacrificed.

Dr. Woldemar A. Weyl

A certain intensity of ultra-violet light can be easily produced by operating an ordinary tungsten filament lamp under overload. Just as underload shifts the energy distribution to longer waves (drying lamps), overload brings out the shortwave part of the spectrum. This can be done only for short periods of time like in photo floodlights, for the lifetime of a lamp decreases rapidly under these conditions.

Fluorescent Light

In order to obtain a more continuous supply of ultra-violet radiation, new devices had to be developed operating on a principle different from incandescence: gas or metal vapor discharge lamps. In these units light, or better radiation, is produced without heat by electric phenomena at relatively low temperatures. The efficiency of these "cold light sources" is consequently very high.

There can be no doubt that the use of this type of illumination will rapidly increase after the war and that in the future, incandescent lamps in our homes, public buildings, factories and streets, will have to give way to cold light sources. We would make a serious mistake, however, if we would try to explain this trend merely from the viewpoint of economy.

The lighting, especially in our homes, is far from being efficient and there is scarcely a person, buying a new lampshade for his living room, who would consider its influence on the efficiency of lighting as a factor affecting his choice. Appearance and price are the major considerations, especially the appearance and the effect it produces in the room. That is exactly where the fluorescent light fits in. The versatility of cold light sources opens new possibilities to the interior decorator.

Here we might say one word about the characteristic feature of fluorescent light. It is easily possible to produce color effects which cannot be obtained by other means. The filtered light of an incandescent lamp consists of a continuous broad spectral range, whereas fluorescent pigments are available whose light emission consists of one or several rather sharp bands. This structure of the emission spectrum gives the color a brilliancy which distinguishes it from that of enameled incandescent lamps. Fluorescent pigments and paints, as well as fluorescent paper and textiles, are now produced commercially and there can be no doubt that these materials offer one of the most promising fields for artists and interior decorators if they have enough imagination to take advantage of these possibilities.

With incandescent lamps, the nature of the light emitted is chiefly a function of the temperature of the filament. The color of the light can only be modified by selective absorption which means that by the use of

filter glasses a certain part of the spectrum is taken out. If, for instance, we want red illumination from an incandescent lamp all we can do is to use a red glass or enamel absorbing the blue, green and yellow part of the spectrum allowing only the red light to pass.

In cold light sources, on the other hand, the temperature is rather insignificant as compared with the nature of the gas or vapor in which the electric discharge occurs. That makes it possible, by proper selection of the medium, to produce various color effects. An intensive yellow light for instance, can be obtained very economically by using sodium vapor and illumination with sodium light has already started to replace the white illumination on our highways. Mercury vapor produces a green light, and besides, a high intensity of ultra-violet radiation. Vapor discharge lamps providing monochromatic light have already found widespread application in various scientific laboratories but their industrial utilization is still in an experimental stage.

Bactericidal Lamps

Most vapor lamps, however, are of the mercury type and used to produce ultra-violet. The ultra-violet radiation found many uses in itself. For the sunlamps, a certain part of it is used to produce a regular suntan and act as a complete substitute for the healthful sunshine. Other lamps emitting still shorter wavelengths possess other unique properties. Radiation of shorter wavelength might produce serious irrations of the skin but when properly applied, it can be used to destroy low forms of life; bacteria, germs and certain molds.

The construction of these bactericidal lamps called for a special glass transmitting farther into the ultra-violet than normal glasses but not as far as fused quartz. The short waves produced by a quartz lamp causes the oxygen of the air to react and to form chemical compounds such as ozone and nitrogen oxides. Formation of these compounds is highly undesirable. They are poisonous when inhaled even in low concentrations and besides, they gradually destroy metal parts and thus prevent the installing of these steri-lamps in air conditioning systems.

Again a special glass, completely different in composition from the ordinary glasses, made the construction of these new steri-lamps possible. Their uses after the war can easily be predicted. Already being used in the process of tenderizing meat and sterilizing refrigerators, they will be introduced into kitchens, restaurants and lunch counters, to sterilize knives, forks, glasses, and dishes.

Their use will not remain limited to hospitals and doctor's offices but will be extended to schools, nurseries, public buildings, churches and movies; wherever crowds gather they will prevent the spreading of colds and other contagious diseases.

Ultra-Violet Versatility

The real advantage and the future of the ultra-violet light, however, does not lie in its typical sun-tanning or bactericidal action but in its versatility, especially in the fact that it can be so easily converted into light of any desirable color.

This can be accomplished in two ways. The first method is the most commonly used, it consists of the combination of the ultra-violet light source with a fluorescent enclosure. For this purpose both fluorescent glasses or non-fluorescent glasses, coated with a fluorescent powder can be used. This combination now used for signs and shopwindows, will gradually be installed in our homes.

Especially in combination with fixtures made from fluorescing plastics, this will be the light of the future. Plastics can be easily manufactured in all types of fluorescence. It not only gives the customer a choice and a possibility to express his personal tastes, but it will also help to balance the composition of the light.

An illumination which now works perfectly satisfactorily in a workshop, might be rejected by the butcher for it fails to bring out the color of fresh meat. This is due to insufficient red radiation but it could be compensated for by lighting fixtures having red fluorescence. The mere possibility of selecting individual color shades might appeal to the customer and stimulate his interest in this type of illumination.

The other method to utilize ultra-violet lamps is perhaps not as generally applicable as the first but offers entirely new possibilites. Here the visible light, white or colored, is not produced by one unit but the ultra-violet is used for the "illumination" of the room. The wall, ceiling or objects are coated with fluorescent materials and consequently appear to be glowing in the dark. For several years, the stages have made use of this striking effect.

Black Light

Mercury lamps producing ultra-violet radiation also produce a certain amount of visible light. For those cases where only the "black light" is desired, special filter glasses as available which contain coloring agents such as cobalt and nickel oxide and which are nearly black and absorb all the visible light, allowing only the black light to pass through.

In the hands of the chemist and the physicist this filtered ultra-violet light proved extremely useful. Certain substances can easily be distinguished by their glow or fluorescence when exposed to this light. In crime detection, for instance, the ultra-violet lamp is playing an important role. In the last few years, lamps of this type were turned out in mass production for a relatively low price. That made it possible to use black light sources in combination with fluorescent materials such as specially prepared paper, signs, paints, lacquers or carpets.

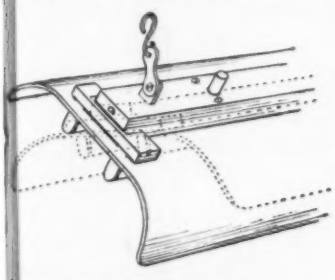
The use of black light is still in its very beginning and it is hard to predict how far it will penetrate into our home. There can be no doubt, however, that it will find a wide application in restaurants and night clubs, theatres and movies, for creating special color effects. It might very well be possible that our future cars during the night will be illuminated with black light and the dials, like those of the speedometer or of the clock, will be coated with luminescent paint.

This arrangement is now in general use in airplanes where it facilitates night flying. Luminescent maps are available so that the dark-adapted eye of the pilot is not disturbed by a flashlight or the illumination of his instrument panel.

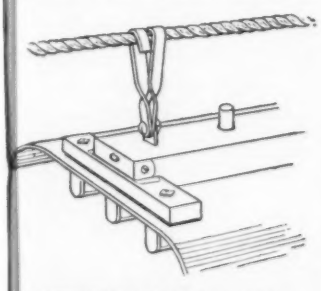
Williams Fluorescent Fixtures

TYPE "VB" INDUSTRIAL

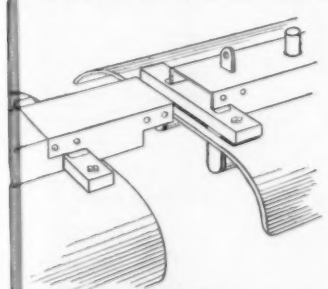
COMPLIES WITH WPB ORDER NO. L78



ADJUSTABLE HANGER ALLOWS FIXTURE TO BE TIPPED TO ANY ANGLE



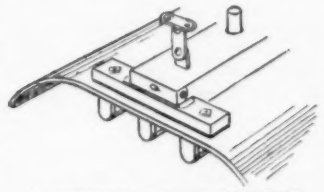
MESSENGER CABLE HANGER



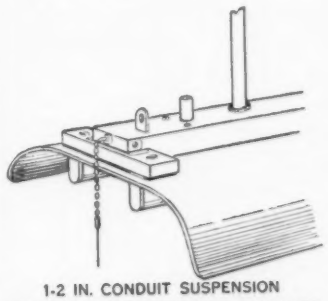
CONNECTOR FOR CONTINUOUS ROW MOUNTING. NOTE WIRE WAY

- Rigid, light weight housing complies with WPB, UL and ETL.
- Non-metallic reflector formed to Bureau of Standards design, with baked-on flex-o-lain reflecting surface, 86% average reflection factor. Moisture - proof — non - chipping — washable. Four-point suspension.
- Easy to install. Same standard model may be hung singly or connected in continuous rows; housing makes wireway. Wiring and connections accessible by removing reflector.
- Adjustable hangers and "S" hooks, as shown in large photograph above, are furnished as standard equipment.
- Made for two, three and four 40 watt lamps and for two 100 watt lamps.

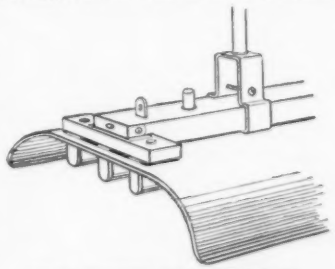
New Commercial Fixtures complying with latest WPB Orders will be ready December 1st. Write us for information.



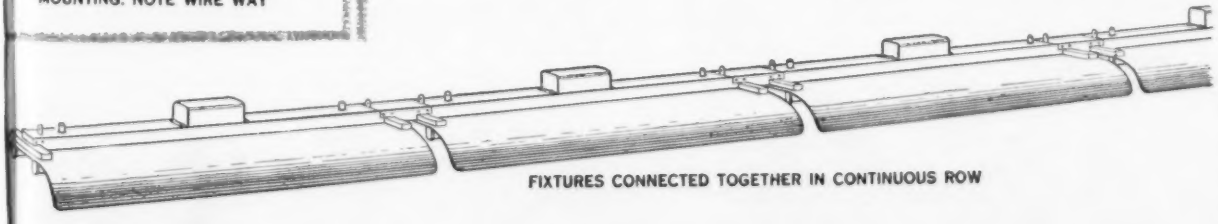
ADJUSTABLE SURFACE MOUNTING



1-2 IN. CONDUIT SUSPENSION
KNOCK-OUT FOR SWITCH IN END PLATE



SLIDE HANGER FOR SURFACE OR PIPE MOUNTING



FIXTURES CONNECTED TOGETHER IN CONTINUOUS ROW

FLEUR-O-LIER ★ ★ ★ TESTED ★ CERTIFIED ★ GUARANTEED

H. E. WILLIAMS PRODUCTS CO.

Recent WPB Orders and Revisions

Copper Sales Procedures

Substantial changes in procedures governing sales of copper by wholesalers and warehouses, new methods to be used by warehouses in entering stock replacement orders for copper wire mill products, and a list of Major Program Symbols for Claimant Agency Programs, were issued in recent weeks by the Copper Division of the War Production Board. The effect of the amended orders was expected by one WPB official to produce much simpler and less complicated procedures which, it was claimed, have a good chance of staying in effect without further changes.

The amendment of CMP Regulation No. 4 brought some changes in procedures governing sales of copper by wholesalers and warehouses. It bans all deliveries of brass and wire mill products after September 30, except to fill authorized controlled material orders. Until that time a warehouse may fill from stock orders for these products bearing preference ratings of AA-5 or higher, up to 2 percent of the total quantity of products shipped during the period from April 1, 1943 to June 30, 1943.

Previous prohibition against ordering from warehouse stocks brass mill products aggregating more than 2,000 pounds of copper content remains, but wire mill products may now be accepted up to 3,000 pounds per month.

Under the new provisions of CMP-4, it is made clear that a warehouse which receives an authorized controlled materials order for copper from a customer and arranges for direct shipments by the produce or another supplier of the materi may not consider the delivery made from its stock and may not re quest replacement. Text of para graph (f) was printed in full page 68 of the August issue WHOLESALER'S SALESMAN.

Entering Replacement Orders

Provision was made on July 26t through issuance of Instructio WPBI-507, for warehouses to pla "Warehouse Replacement Order with either producers or other war houses provided that:

"(1) The total copper content all such orders placed during a calendar month shall not exceed t total copper content of the preced month's deliveries from stock as r ported to the War Production Boa on Form WPB-3009.

"(2) Each such order is marke 'Warehouse Replacement Orde pursuant to the provision of WPB 507.'

"(3) Each such order is plac with a supplier not earlier than t first and not later than the fifteen of each month."

Such instructions cancelled a previous rules as to the method replacement replacing deliveries copper wire mill products fr warehouse stock.

Major Program Symbols

For the information of all bra and copper wire mill warehouse Mr. H. O. King, director of t Copper Division of WPB, releas the following letter regarding cu rent major program symbols:

"For your information we are c closing a list of Major Progra Symbols for Claimant Agency Pr grams, Class 'A' Civilian Type Pro ucts and Class 'B' Product Pr grams. A Major Program Symb consists of the letter and first di

CURRENT MAJOR PROGRAM SYMBOLS

OFFICIAL IDENTIFICATION SYMBOLS FOR CLAIMANT AGENCIES MAJOR PROGRAMS, CLASS "A" CIVILIAN TYPE PRODUCTS AND CLASS "B" PRODUCTS

(In Alphabetical Order)

A-1	E-1	J-1	L-1	N-X	P-1	U-1
A-2		J-2	L-2	N-0	P-2	U-2
A-3	E-1	J-3	L-3	N-1	P-3	U-3
		J-4	L-4	N-2		U-4
B-1	F-1	J-5		N-3	R-1	U-5
B-2	F-2	J-6	M-0	N-4	R-2	U-6
B-3	F-3	J-7	M-1	N-5		U-7
B-4	F-4	J-8	M-2	N-6	S-1	U-8
B-5	F-5	J-9	M-3	N-7	S-2	U-9
B-6			M-4	N-8	S-3	
B-7	G-1	K-1	M-5	N-9	S-4	W-1
B-8	G-2	K-2	M-6	N-2999	S-5	W-2
B-9	G-3	K-3	M-7		S-6	W-3
	G-4	K-4	M-8	O-1	S-7	W-4
C-1	G-5	K-5	M-9	O-2	S-8	W-5
C-2	G-6	K-6		O-3	S-9	W-7
C-3	G-7	K-7		O-4		W-8
C-4	G-8	K-8		O-5	T-1	W-9
C-5	G-9	K-9		O-6	T-2	
C-6				O-9	T-3	
	H-1				T-4	
					T-5	
					T-6	
					T-7	

SPECIAL SYMBOLS: MRO, RO, SO

Please note that XXX symbols have been adopted as follows:

Old Symbols	New Symbols
MRO-P-142	T-7
MRO-U	U-9
MRO-P-56	S-7
MRO-P-68	S-8
MRO-P-98-h	P-3

When orders are received under the above old symbols, report them under the new symbols.

All other MRO should be reported as MRO, without any further identification

PRINT IN

of an allotment number, such as A-2, G-3, N-4. Certain special symbols are also listed.

"Please check all your orders against this list. In the event any order carries a symbol not found on the list, communicate immediately with your customer in order to determine the correct symbol for the order."

The list of symbols mentioned in Mr. King's letter, are reproduced here.

Copper Wire For Farmers

A simple method for use by warehouses and retailers in supplying copper wire to farmers under the Controlled Materials Plan has been announced by the War Production Board.

In order to obtain copper wire in excess of the 75 feet permitted under Priorities Regulation No. 19, farmers may obtain "Copper Wire Allotment Certificates" which are issued by county USDA War Boards on the basis of applications which show actual need of copper wire for farm operations.

Warehouses which receive orders from farmers or retailers for copper wire, supported by Copper Wire Allotment Certificates, must treat them as though they were authorized controlled materials orders under CMP.

Retailers must fill orders for copper wire, accompanied by Copper Wire Allotment Certificates, in the order in which they are received, and must give preference to such orders over orders which are supported by preference ratings alone.

Copper Wire Exempted From L-63 Limitations

Copper wire and cable in distributors' stocks are no longer subject to inventory restrictions of L-63, according to a recent ruling of the War Production Board.

The exemption covers any "bare or insulated wire or cable for electrical conduction made from copper or copper base alloy."

As a result of the action, suppliers are not limited to the amount of copper wire and cable they may purchase, but sales of such materials cannot be included in their computations of maximum permissable inventories as determined by L-63.

However, the WPB pointed out that deliveries of copper wire and cable from warehouses are subject to Controlled Materials Plan Regulation No. 4. Replacement of these inventories are made in accordance with instructions or directives sent directly to warehouses by WPB. In view of these controls, L-63 restrictions on inventories were found to be no longer necessary.

Electronics—Used Parts Must be Scrapped

Used, defective, exhausted or condemned parts for electronic equipment must be disposed of by producers or suppliers, either for salvage or be destroyed, within sixty days, the War Production Board announced recently in an amendment to L-265. This action was taken to prevent such defective parts from getting back into trade channels, the WPB announced.

Electronics Agency Now Operating

The Electronic Research Supply Agency, formed to supply critical materials and components not readily available from commercial sources to laboratories engaged in radio and radar research and development for the Armed Forces, is now ready to operate, WPB has announced.

The new agency was set up by the Defense Supplies Corporation at the request of the Office of Scientific Research and Development and the War Production Board. It carries inventories purchased with the assistance of preference ratings assigned by WPB or extended by its customers. Operating profits or losses accrue to the Defense Supplies Corporation.

Wholesalers, buying for the account of approved laboratories, must certify that they have not in inventory the items being sought and that they have not placed purchase orders for them elsewhere.

Elevator Parts Order Interpreted

Because a number of questions have arisen regarding replacements of elevator parts as covered in the provisions of General Conservation Order L-89 as amended June 2, Interpretation 1 to that order was issued recently by the War Production Board to clarify certain points.

The order exempts from the necessity for authorization on Form PD-411 (now WPB 1236) purchase orders for maintenance parts up to $25 per elevator and not to exceed $50 worth of such parts per elevator in any one year. The interpretation states that these dollar value limitations refer to the retail sales price of the parts exclusive of the cost of labor or other services required for installation. Moreover, the exemption covers small maintenance or replacement parts (within the dollar value limits) necessary to keep the elevator in sound working condition even thought there is some change in type.

Repair parts, irrespective of value, are exempted from authorization requirements by L-89 only when there has been an actual breakdown or suspension of operations of the elevator. The Interpretation makes clear that suspension of operations may be considered to have occurred when (1) the condition of the cables or other parts would make continued operation of the elevator without repair definitely dangerous; and (2) the cables or other parts have been condemned under a State law or municipal ordinance requiring suspension of operations unless replacement is made within the period specified on the inspector's report (normally 30 to 90 days).

Flashlight Batteries For Civilian Use

In a recent communication, William S. James, head of the Electrical Supplies Unit of the Wholesale and Retail Trade Division, WPB, announced that:

(Continued on page 116)

INT IN BINDING

Your Bond Selling Responsibilities Double!

Starting September 9th, your Government will conduct the greatest drive for dollars from individuals in the history of the world—the 3rd War Loan.

This money, to finance the invasion phase of the war, must come in large part from individuals on payrolls.

Right here's where YOUR bond selling responsibilities DOUBLE!

For this extra money must be raised *in addition* to keeping the already established Pay Roll Allotment Plan steadily climbing. At the same time, every individual on Pay Roll Allotment must be urged to dig deep into his pocket to buy *extra* bonds, in order to play his full part in the 3rd War Loan.

Your now *doubled duties* call for these two steps:

1. If you are in charge of your Pay Roll Plan, check up on it at once—or see that whoever is in charge, does so. See that it is hitting on all cylinders—*and keep it climbing!* Sharply increased Pay Roll percentages are the best warranty of sufficient post war purchasing power to keep the nation's plants (*and yours*) busy.

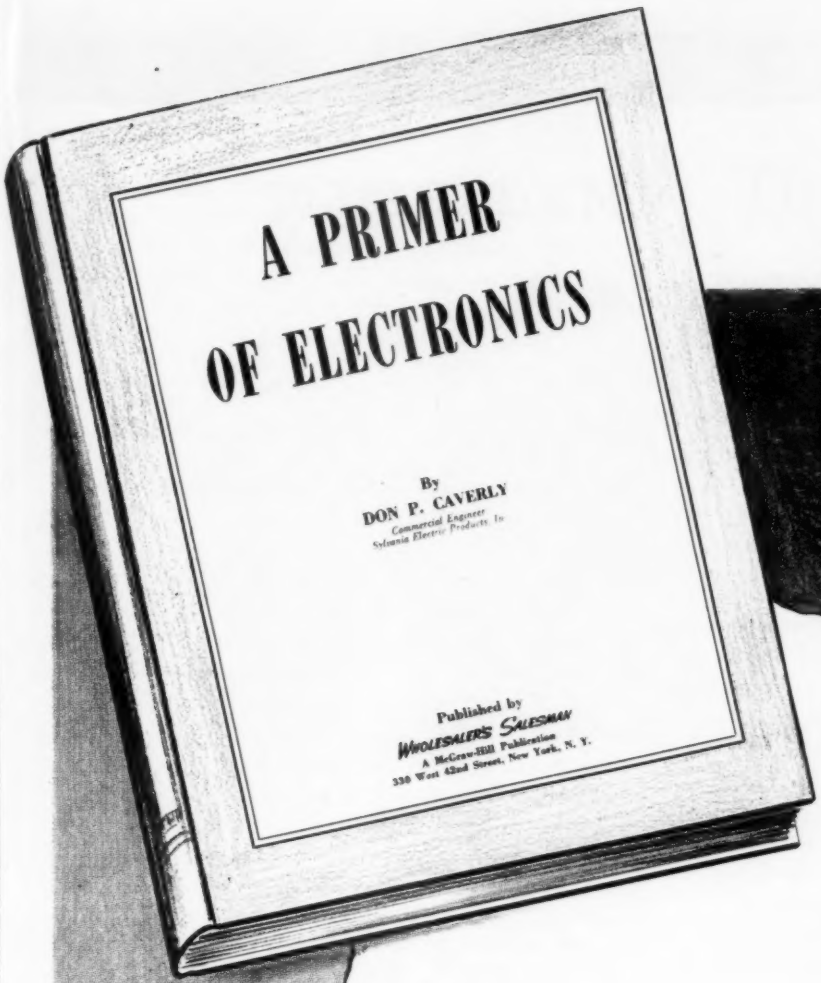
2. In the 3rd War Loan, every individual on the Pay Roll Plan will be asked to put an *extra two weeks salary* into War Bonds—over and above his regular allotment. Appoint yourself as one of the salesmen—and see that this sales force has every opportunity to do a real selling job. The sale of these *extra* bonds cuts the inflationary gap and builds added post-war purchasing power.

Financing this war is a tremendous task—but 130,000,000 Americans are going to see it through 100%! This is their own best *individual* opportunity to share in winning the war. The more frequently and more intelligently this sales story is told, the better the average citizen can be made to understand the wisdom of turning every available loose dollar into the finest and safest investment in the world—United States War Bonds.

★ ★ ★

BACK THE ATTACK With War Bonds!

This space is a contribution to victory tdoay and sound business tomorrow by WHOLESALER'S SALESMAN



IN THIS ISSUE

PART II

Chapters 3, 4 and 5

Summary of Preceding Chapters

PART I, ELECTRIC CURRENT—AS PUBLISHED IN AUGUST, 1943

CHAPTER 1 Deals with the basic structure of the atom, with particular emphasis on the physical characteristics of the electron itself. It covers certain natural electrical phenomena such as static and electron discharges found in everyday life, electric current flow, and units of measurement such as the ampere, the volt and the ohm.

CHAPTER 2 Covers the characteristics of electrical conductors and the effect on current flow. The unit of electric power, the watt, is discussed and simple formulae given. An explanation of both potential and kinetic energy is included with simple illustrations.

(This work will be available complete in book form at $2.00 per copy. For large quantities, prices on request.)

PART II MAGNETISM

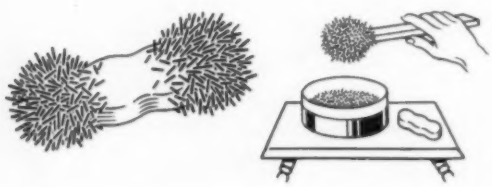
Chapter 3

AUTHOR'S NOTE: At the outset it might be well to point out that previous teachings explain electric current as flowing from positive to negative. This explanation has been the basis of certain established fundamental rules governing the direction of electromagnetic forces and motor or generator rotation. However, with the development of an understanding of electrons as basic negative charges, it becomes evident that they must flow in the opposite direction—toward positive— so that current flow is generally thought of as going in one direction, but electron flow in the other. Therefore, in order to avoid a confliction the author has chosen to refer to current flow rather than to electron flow, so that the old rules can be applied for clearer explanations. The reader may, if he wishes and it is not confusing, remember that the electrons are flowing the other way whenever the ***direction*** of electric current flow is mentioned in Parts I and II. In Part IV, electron flow is described more in detail.

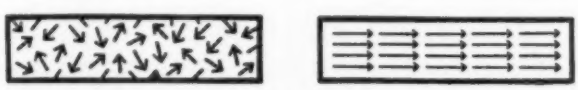
Magnetic Force

No one knows exactly what magnetism is. It is a force which is related in some way to electronic flow, and one which can be manufactured, or at least made evident at will, as well as be accurately controlled. It is present in thousands of devices in every day use and is as important in the consideration of electricity as electronic flow itself. The earth is a gigantic magnet with North and South poles the same as the little U-shaped steel bars with which all children are familiar.

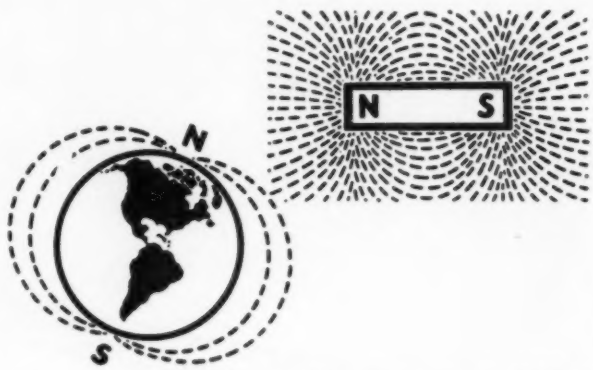
Magnetic force has been known for thousands of years. It is said to have been discovered near the city of Magnesia in Asia Minor, when "magnetite" iron ore was found to have the ability to attract other particles of iron. Early navigators used elongated pieces of the ore as compasses and called them "leading stones" from which the name "lodestone" is derived. When a steel bar is rubbed on lodestone it becomes "magnetized" and will attract iron. Just what happens when a steel bar is magnetized is not yet clear. Some scientists' theory of magnetism is that the steel is composed of a great many small magnetized particles which point in every direction under normal conditions, but when rubbed with lodestone, or otherwise magnetized, these little particles all turn in the same direction and thus magnetize the steel bar.



Magnetic iron, or "lodestone" was the first known magnet.



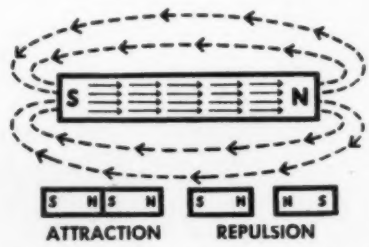
The theory of magnetism—a steel bar, (left) becomes magnetized (right) and the tiny particles all point in one direction.



The arrangement of magnetic fields to the North and South poles of a permanent magnet, also to the earth.

Magnetic lines of force have a very definite and consistent pattern which is called a magnetic field. If a piece of paper is placed over a bar magnet and iron filings sprinkled on the paper, they will arrange themselves to coincide with the pattern of the field. These lines of force are, of course, imaginary ones along which the attractive or repulsive force of the magnet acts. Their direction is generally assumed to be from the North Pole to the South Pole and back through the interior of the magnet forming closed loops called the "magnetic circuit."

Like *unlike* charges of electricity (a negative



Magnetic lines are imaginery lines along which the attractive or repulsive force of the magnet acts.

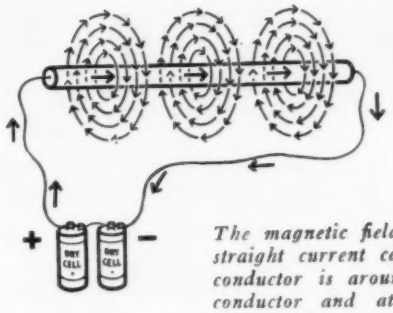
and a positive), *unlike* magnetic poles attract each other, and *like* magnetic poles repel each other, as do two positive or two negative electrical charges. The intensity of attraction and repulsion is a function of the pole strengths of the magnets.

Electromagnetism

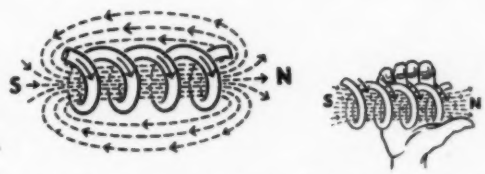
The similar characteristics of current flow and magnetic lines of force have been indicated in the discussion above. Actually, current flow can be used to produce a magnetic field, *or*, a magnetic field can be used to generate a pressure or electromotive force (voltage) which will cause current flow. As a matter of fact, any conductor through which current is flowing has magnetic force around it and at right angles to it. One way of remembering this relationship is to visualize the operation of driving a screw into a wall. The direction of current flow would be the same as the movement of the screw into the wall—away from the body—whereas the magnetic lines of force around the conductor carrying the current would be in the direction of the twist of the screwdriver —clockwise to the person facing the wall.

If a conductor is coiled, the space within the coil as well as around it becomes a magnetic field and an iron bar within the space becomes an electromagnet when current flows through the coil. It will be recalled that Ampere discovered the "Right Hand Rule" (previously illustrated), which tells us that with a coil held in the right hand and the current flowing in the direction of the curled fingers, the thumb always points to the north pole of the magnetic field established within the coil by the current it is carrying.

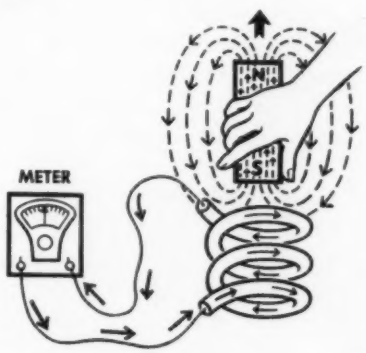
The other equally important relationship between current flow and magnetic force seems to be the reverse of the production field described above. When a conductor is moved across a magnetic field an electromotive force (E.M.F.) is generated which causes current to flow in the conductor (if the circuit is closed). To express the same idea another way, if a permanent magnet is plunged into a coil of wire (or removed from it), the magnetic lines of force "cut" the wire and induce an electromotive force or pressure (voltage) which causes current flow in the circuit. Such voltage exists only while the magnet is in motion within the coil and ceases when it is completely removed. This is the basic principle behind the great electric generators in our power plants.



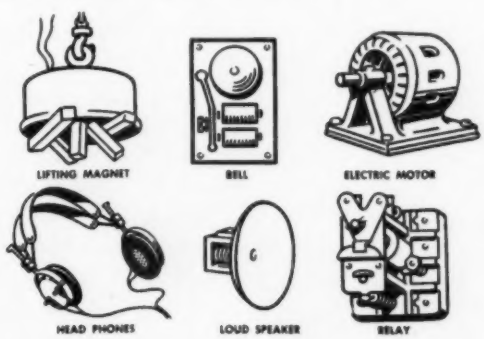
The magnetic field of a straight current carrying conductor is around the conductor and at right angles to it.



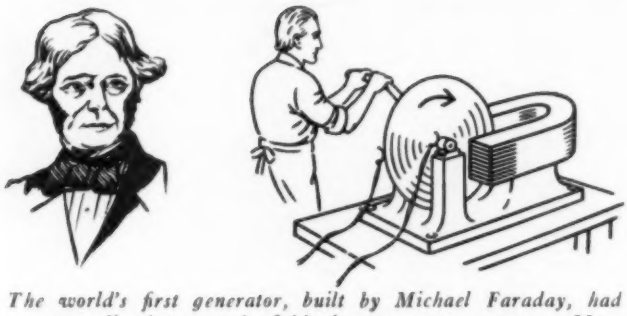
When an electric current flows through a coil of wire, the region or space inside and outside the coil become magnetized.



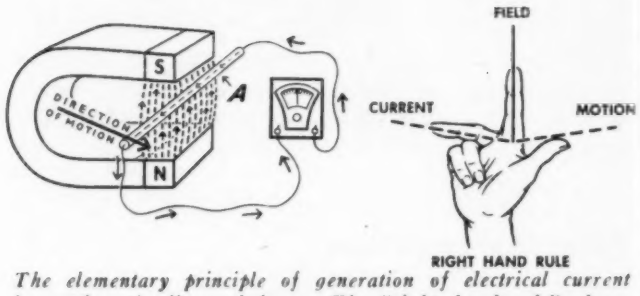
Moving a permanent magnet within a coil of wire causes a current to flow in the electric circuit. This principle is the basis for electric generators.



There are many practical uses of electromagnetism in use



The world's first generator, built by Michael Faraday, had a copper disc between the field of a permanent magnet. Manpower supplied the kinetic energy.



The elementary principle of generation of electrical current by cutting the lines of force. The "right hand rule" shows method of determining direction of the current flow.

Generation of Electric Power

Although there are many practical uses of electromagnetism the most important one is, of course, in the generator.

Michael Faraday, an English scientist, constructed the first electrical generator. It was a simple device as compared with today's massive machines, and consisted of a copper disc about one foot in diameter which was rotated between the poles of a permanent magnet.

A man supplied the kinetic energy necessary to turn the disc. In modern power plants this energy is provided by falling water (hydro-electric generators), by steam produced in boilers using coal or oil as a fuel (steam turbines), or by internal combustion engines (Diesel generators).

The turning copper disc in Faraday's device cut the lines of force of the magnet and an electric current was generated which flowed from the disc through contact brushes at its rim and shaft, and thus into the conductors of the circuit.

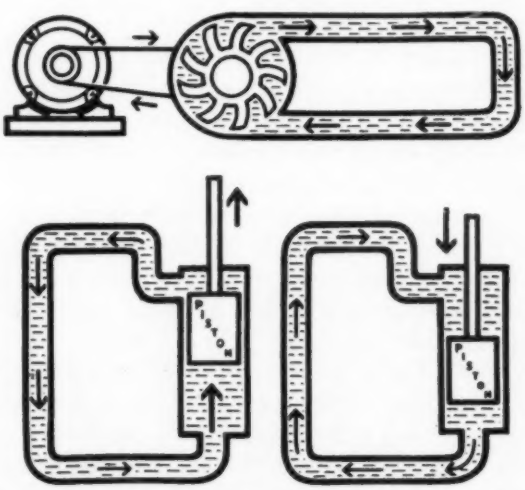
There are three forces involved in the simple generator described above—first, the physical force provided by the man turning the disc; second, the magnetic lines of force between the poles of the magnet; the third, the electromotive force or voltage generated in the disc which caused the flow of electric current. The definite relationship between the directions in which these three forces are exerted is best described in another right hand rule, called "Fleming's Rule."

It has been previously pointed out that a conductor must be in motion through a magnetic field if a flow of current is to be set up within it. If this conductor ("A" in the diagram) is moved in the direction indicated with respect to the North and South poles of the magnet, then current will always flow in the direction shown by the arrows. "Fleming's Rule" demonstrates this relationship by stating that if the conductor is moved in the direction of the thumb, and the forefinger points the direction of the magnetic force (toward the South pole), then the current in the conductor will flow in the direction of the extended second finger—all fingers to be at right angles to each other.

It has already been explained that when electrons flow along a conductor in one direction only, *Direct Current* is said to be flowing. This may be compared to a closed pipe circuit through which water flows continually from a centrifugal pump.

Alternating Current, on the other hand, changes or alternates its direction at definite intervals. It might be compared to a closed pipe circuit in which water is constantly circulated back and forth by a valveless reciprocating pump.

Thus far, the source of pressure or E.M.F. (voltage) has been generally considered as a battery of established potential. It has just been

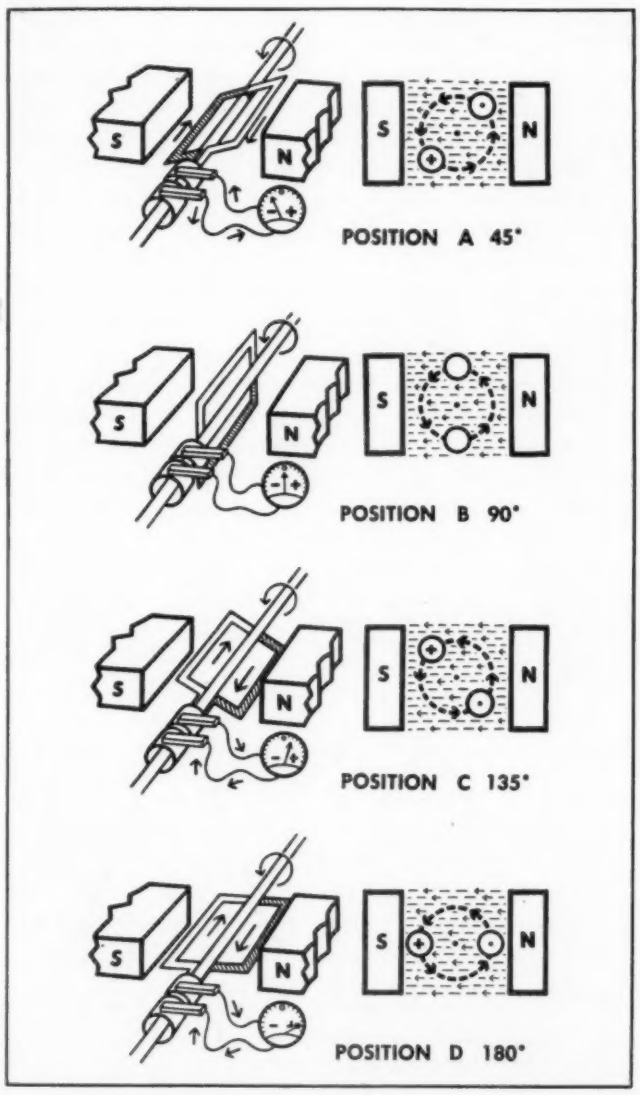


Direct current, top illustration, is that which flows continuously in one direction. Alternating current changes direction periodically, similarly to the water in the closed pipe circuit above.

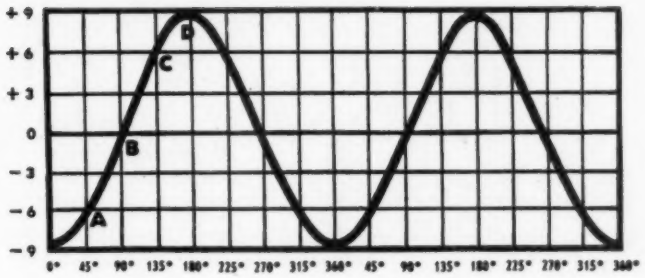
pointed out, however, that when a magnetic field is cut by a conductor, current will be caused to flow in that conductor in a direction determined by its relative motion through the lines of magnetic force. Therefore, it is obvious that current can be produced in a loop of wire being turned in the field of a magnet so that the loop cuts across the lines of magnetic force. This is similar to Faraday's generator except that a loop of wire is used instead of a copper disc.

A.C. Generators

As previously explained, the direction of induced E. M. F. in the wire loop is dependent upon the direction of its movement through the magnetic lines of force. It can be seen from the diagram of position A, that as the loop is turned counter-clockwise, the right hand half of the loop cuts upward through the lines of force. By applying "Fleming's Rule" it is found that the current flow will be in the direction indicated by the straight arrow, or toward the reader. On the other hand, the left half of the loop (shaded half) cuts downward through the magnetic field and the flow will be in the opposite direction. But since the loop is a continuous one, the current flows on around and out through the brushes into the circuit and back again. Now when the loop reaches position B no lines of force are being cut so there is no E. M. F. (voltage) generated at this point.



Demonstrating the principle of alternating current.

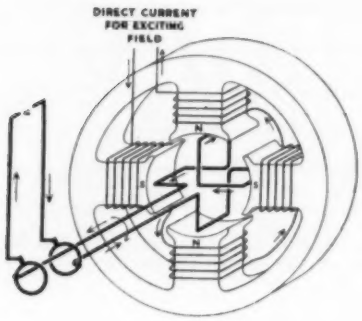


Curves of alternating voltage.

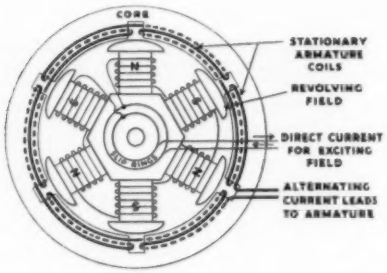
As the loop continues to turn, position C is reached and it can be seen that the half of the loop which *was* cutting downward on the left (shaded half) is *now* cutting upward on the right, so that current now must flow in the opposite direction through that half as well as through the other half. Thus we have a complete reversal of current flow direction in 180° of rotation—or alternating current being generated.

Since at position B there was no E. M. F. being generated, it follows that at position D the maximum value of E.M.F. will be found since in that position the loop is cutting the greatest number of lines of force. This maximum value is reached gradually as the loop approaches a horizontal position (D). Also, the minimum or zero value is reached gradually as it cuts fewer and fewer lines of force and eventually is in a vertical position (B).

A curve can be plotted for the rise and fall of the generated E.M.F. This curve is called a *"sine wave."* The chart shows this wave form of a modern A. C. generator. The positions A, B, C and D, just described, are shown at 45°, 90°, 135°, and 180°. The strength of the E.M.F. generated at these positions is indicated above



Illustrating simple generator windings.



Illustrations Courtesy Fairbanks, Morse and Co.

and below the zero value represented by the center horizontal line. Thus the strength of the E.M.F. is zero at B, and maximum at D, and it is negative at A, and positive at C or D.

When the voltage has gone from zero to one maximum value and back to zero again, and then to the other maxmum (in the opposite direction), and back to zero—in other words completed one whole wave from 0° to 360°—it has completed a *cycle*. The number of cycles completed in one second is called the *frequency*.

The large present-day A.C. generators involve the same principle of the wire loop except that many wire loops are used and the process is reversed—that is, the magnets revolve inside the wire loops (armature winding), and the magnets instead of being permanent magnets are electromagnets, the magnetic field being created by passing an "exciting" current through the coils of the electromagnets. Alternating currents are usually generated at a frequency of 60 cycles per second, although 25 and 40 are not uncommon.

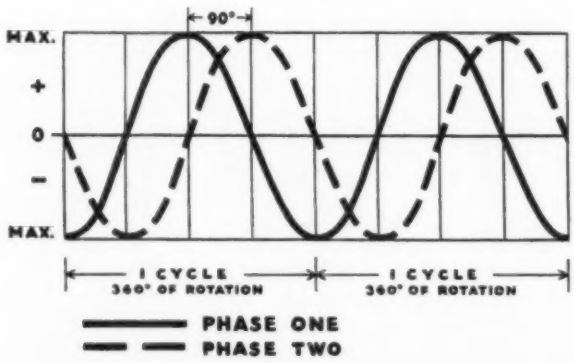
Phase Relation

It has just been shown how the simple loop A.C. Generator produces its E.M.F. in the form of a single rising and falling wave. It is called, therefore, a *single phase* generator.

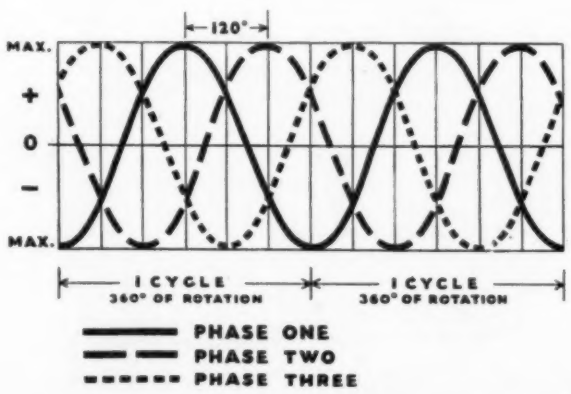
If two separate loops at right angles to each other are used, and the E.M.F. generated pushes electrons out through sets of brushes, it is obvious that the resulting two sets of waves would not coincide, because the loops would be cutting the magnetic lines of force at different times. In other words, when one is at its peak E.M.F., the other is at zero, which means that a quarter of a cycle later the opposite condition will exist, or that phase *one* follows phase *two* by a quarter cycle. A generator of this type would be called a two-phase alternator.

When three single phase windings are placed on the same shaft with the windings brought out through their respective slip rings and brushes, the voltage waves will occur a third of a cycle apart as shown in the diagram. This manner of generating 3-phase current is used to a very large extent throughout the country. Actually, six separate wires are not used since it is possible to connect all the phases together in such a way that only three wires will serve the purpose.

When a fourth grounded (neutral) wire is introduced into the system, a 3-phase, 4-wire system results, with approximately one-half as much voltage existing between any one of the phase wires and the ground, as between two phase wires.



Sine waves of a 2-phase A.C. generator.



Sine waves of a 3-phase A.C. generator.

Although a greater number of phases are possible in a generator, there is no economic justification for such equipment except in very specialized applications.

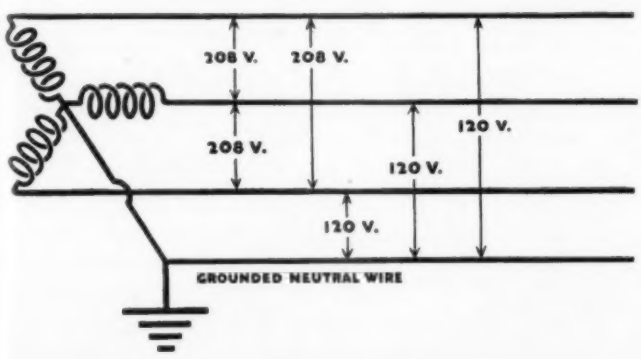
D.C. Generators

A direct current generator actually produces its E.M.F. (voltage) in the same way that an alternating current generator does. The direct or unidirectional current is obtained by a method of carrying it away from the machine. This method involves the reversal of connections at just the precise instant when the current being generated is changing its direction. In other words, if in Position B of the simple loop generator diagrams, the connections to the meter are reversed, the meter would still show negative instead of positive at Position C and D. But when the shaded half reached the top in a vertical position, the connection would have to be changed back again to keep the current still flowing in the same direction.

In a D.C. generator this changing is done as it revolves by means of a device on the shaft called a "commutator." The brushes in contact with the commutator are so placed that the current is always carried away in the same direction.

It might appear that although the current is "direct" in a generator of this type there will be a decided pulsation due to the rise and fall of E.M.F. values. This would be true in the simple loop generator but in modern multipolar machines, the design of the armature overcomes this pulsation.

Volumes can and have been written on the design and various winding methods of generator armatures and fields. It is a study by itself and an involved one. As such, further discussion in this treatise would be out-of-place, since it is intended here only to present the primary factors and uses of magnetism.



The 4-wire, 3-phase distribution system.

Motors

Basically, an electric motor reverses the process of a generator. If, instead of turning the wire loop through a magnetic field and allowing the generated current to flow out of it, we connect the loop to a source of E.M.F. (a battery or generator) and push the current flow through it, the loop will turn by itself, that is, it will turn until it reaches the horizontal position D. At this point it can go no farther because to do so would be contrary to the various forces involved —the magnetic lines of force between the poles of the magnet, the direction of the current flow resulting from the electromotive force (E.M.F.) from the battery, and the directional force of the turning loop.

Now, if the polarity is reversed (connections reversed) and the loop started gently, it will immediately flip around another 180° where it will stop again for the same reasons noted above.

In A. D.C. motor this changing of connections is done automatically as the armature revolves, by means of a split commutator on the shaft which reverses the direction of current flow at each half revolution. The momentum of the armature as it revolves, carries it past the "dead point" so that a continuously running D.C. motor results. The motor will run as long as current is forced through its armature via the alternating device or commutator on the shaft.

There is a motor rule for determining the direction of rotation of a motor which is exactly the same as Fleming's rule except that the left hand is used instead of the right.

There are many types of motors for both A.C. and D.C. operation, the differences between them being primarily in the methods of winding the armature and field coils, the number of poles and a few other factors. The selection of the best type of motor for any particular application is governed by the kind of service required. Some applications require high speed, some a constant slower speed, others a readily controlled variable speed, and still others great turning power. Some times a motor is desired with a combination of two or more of these factors plus other additional ones, and new and better types are constantly being developed.

Like generators, a complete study of motors would require hundreds of pages. Therefore, the discussion here must be limited to the basic

magnetic principles and laws involved in motor rotation.

Counter-Electromotive Force

Lenz, a physicist of the 19th century proved that electromagnetically induced currents (currents generated in a conductor cutting through a magnetic field) have such a direction that their own magnetic fields (produced in turn by the current flow) tend to oppose the motion which produces them. In other words the forces which make the wire loop turn in the simple motor, create other forces around the loop which oppose its motion. It is a sort of a conflict between the generating characteristics and the motor characteristics of the device. This opposing voltage generated in the loop by virtue of its cutting magnetic lines of force, pushes a current flow in the opposite direction to the other current flow which is deliberately forced *into* the loop from a battery or generator in order to make it turn.

The voltage applied from the outside source is usually called the *impressed E.M.F.*, whereas the voltage generated in the loop (armature) is called the counter E.M.F. The difference between the two may be called the *net* E.M.F.

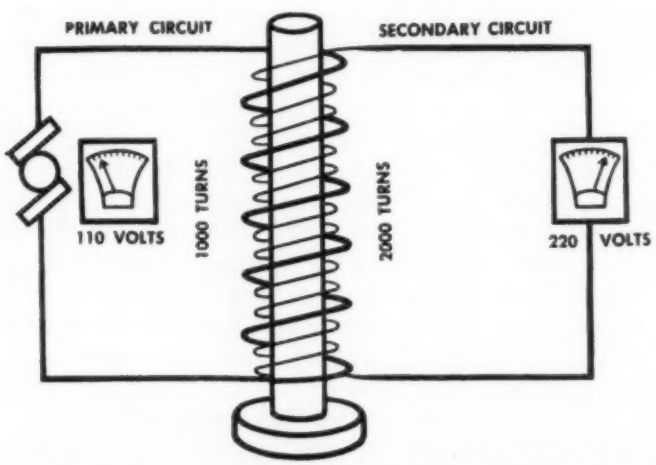
This is important in motor operation because as a motor gains in speed, its counter E.M.F. becomes greater as more and more magnetic lines of force are being cut. This, in turn, means that the net E.M.F. becomes less and less with the result that less current flows in the motor circuit. Thus a motor requires less current when running full speed than when starting.

To compensate for this difference in starting and running currents, starting boxes which are variable resistors or rheostats, are frequently placed in a motor circuit. It is obvious that if the full line voltage is impressed on the motor while starting, and before any counter E.M.F. (counter voltage) is generated by the rotating armature, the coils might be seriously damaged or burned out. So, a gradual application of voltage by means of the starting compensator as the motor speed will eliminate such damage.

Chapter 4

Transformers

Since a conductor moving through magnetic lines of force will have an E.M.F. (voltage) set up within it, the strength of which will depend upon the number of lines of force being cut, it follows that any change in magnetic lines of force around a stationary conductor will also generate or *induce* an E.M.F. in that conductor.



Transformers operate on this principle of mutual induction.

It will be recalled that alternating current is constantly changing its direction, so that a magnetic field produced by a coil through which A.C. is flowing will be in a constant state of change, and, therefore, capable of *inducing* an E.M.F. in another coil. This law of magnetism is usually referred to as the principle of *mutual induction*, and is the basis of transformer operation.

A simple transformer consists of a ring, or open square of iron called a core with two coils of wire wound around it on opposite sides, and not connected together. One coil would have a current flow pushed through it by a source of alternating E.M.F. (A.C. generator), so that the magnetic field produced in the core would be constantly changing. This coil is called the *primary*. The second coil on the opposite side would have an E.M.F. induced in it by the fluctuating lines of force in the magnetic field of the first coil, and if the circuit of the second coil is completed or closed, an induced current will flow in it. The second coil is called the *secondary*.

Thus in a transformer we have a means of inducing alternating current from one circuit to

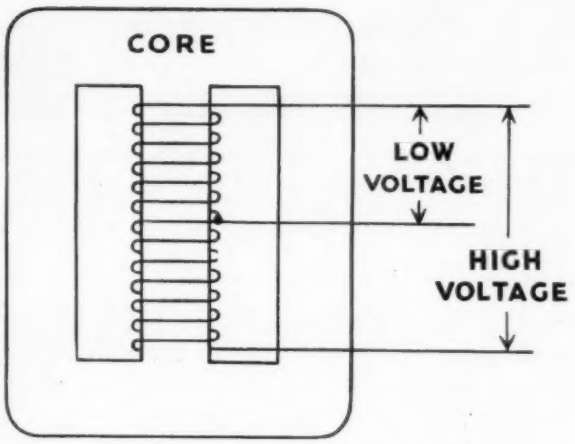


Diagram of transformer core windings

another one by means of magnetism, the two circuits not being directly connected in any way. Since a reversal of the magnetic field in the primary coil takes place at every alternation of the generator supplying the E.M.F., and since these lines of force generally follow the iron core and pass through the secondary coil, it is obvious that the induced E.M.F. in the secondary coil will have exactly the same alternating characteristics or frequency.

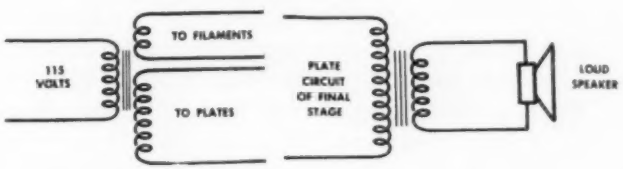
There is, however, a definite ratio between the strength of voltage in one and in the other, and in this ratio lies the practical use of the transformer.

The function of a transformer is to increase or decrease the voltage of an alternating current. The voltage in the secondary circuit depends upon the ratio of turns in its coil to the terms in the primary circuit coil. If the primary coil has, for example, 20 turns and the secondary coil, 40 turns, the ratio is of course, 1 to 2, so that with the primary connected to a 120 volt A.C. circuit, 240 volts A.C. will be produced in the secondary circuit. Conversely if the 120 volt line is connected to the 40-turn coil, thus making it the primary, only 60 volts will result in the 20-turn or secondary coil.

This relationship holds true in all simple transformers regardless of the number of turns used in either the primary or secondary, and it can be expressed as follows (except for relatively small losses):

$$\frac{\text{Primary voltage}}{\text{Secondary voltage}} = \frac{\text{Primary turns}}{\text{Secondary turns}}$$

Transformers may be wound in different ways. One common method which saves space and weight is to place one winding over the other on the same core. In some applications such as radio, the power transformer may have two or more secondary windings, each with a different ratio to the primary so that different voltages may be supplied to the different elements of the radio tubes as required.

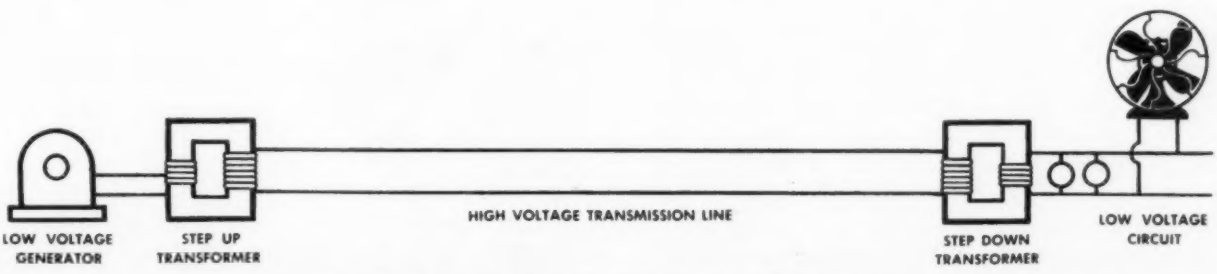


A radio power transformer, left, is one example of many methods of winding transformers. So is the circuit of the output on the loudspeaker system shown on right.

The transmission of power from the generating plants to thousands of homes, stores and factories would not be feasible without transformers, since they make transmission of high voltages possible over long distances with consequent lower line losses.

Another type of winding is called an autotransformer. This type differs in that only one winding is used which is divided into two parts. In this case the coils are not separated, but the required voltage change is accomplished.

There is one other factor in transformer construction that should be considered briefly before leaving the subject, and that is the core construction. When an induced E.M.F. is set up in a solid bar of metal, the resulting flow of electrons will "eddy" around in the metal and develop



Transformers are important in electric power distribution.

a magnetic field of their own. These *eddy currents* will cause a "dragging" or "damping" effect on the main magnetic field. In order to eliminate this, transformer cores (as well as the cores of other electromagnetic devices such as motors) are built up of thin sheets of metal insulated from each other, instead of a solid bar of metal. This construction, which is called a laminated core, prevents the eddy currents from flowing around but permits the main magnetic field to be useful.

While there is an increase in voltage in a transformer, there is a *decrease* in current in the same proportion. In other words, the voltage increase is gained at the expense of current. This can be expressed as follows:

$$\frac{\text{Primary Current}}{\text{Secondary Current}} = \frac{\text{Secondary Turns}}{\text{Primary Turns}}$$

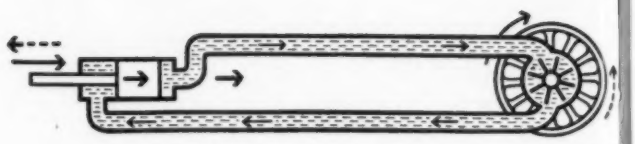
But, since wattage or power is the product of voltage and amperage (current), it can be seen that there is no appreciable loss of power in a transformer.

Inductance

It has been explained that when a bar magnet is plunged into a coil of wire and removed from it several times in quick succession, an alternating current is generated in the circuit of the coil as long as the magnet is kept in motion. It has also been pointed out that if an alternating current is forced through a coil around a stationary bar magnet from an external source, it amounts to the same thing as moving the magnet, so that we have in the latter case two distinct electromotive forces—one from the external source and one from the magnetic field—pushing current in opposite directions within the coil. The pressure generated by the magnetic field, it will be recalled, is the counter-electromotive force. This counter E.M.F. opposes the start of current flow from the impressed E.M.F., and likewise opposes the stopping of it after it is once flowing, much like the inertia of stationary and moving objects.

The property of an electric circuit, by which it opposes any change in the current flow through it, is called *inductance*. In other words, the current has a tendency to be sluggish in responding to the rapid alternations of the voltage or E.M.F., and may lag behind it. Thus the voltage may reach its pressure peak before the current reaches its flow peak.

A water pipe analogy may be used to illustrate inductance. In the diagram, the piston can be



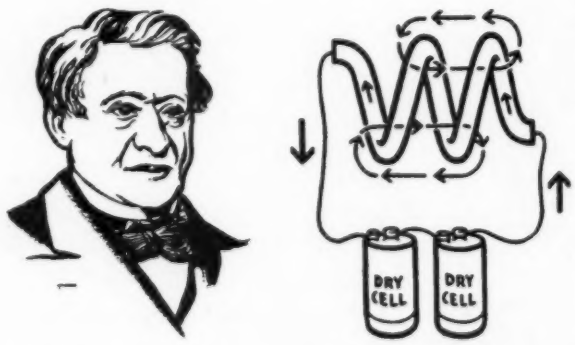
Inductance in an electric circuit is similar to inertia—it is the property in the circuit which opposes any change in the current passing through it. The flywheel in the water circuit above presents the same opposition to the flow of water through the pipes.

compared to the source of alternating E.M.F., the water in the pipe circuit to the current flow, and the heavy water wheel to the inductance. As the water in the pipe changes its direction it must start the heavy wheel in motion—first in one direction and then in the other. The sluggishness of the water in quickly changing its direction of flow in the arrangement can be easily visualized. The alternating motion of the wheel will obviously lag behind the motion of the piston.

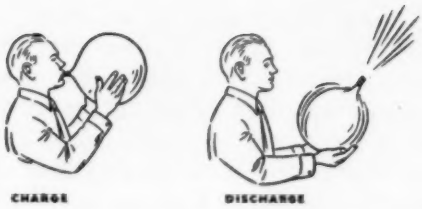
The unit for measuring self-induction is called the *henry*—named after Joseph Henry, an American Scientist. One henry is the inductance which produces an induced E.M.F. of one volt when the current is changing at the rate of one ampere per second.

Capacitance—Condensers

The term capacitance is always used in conjunction with a device called a condenser. As a matter of fact, the word *capacitor* is frequently used instead of condenser. Since "capacity" usually means "all a thing will hold," a condenser or capacitor can be thought of as a sort of reservoir in which an abundance of electrons can be temporarily stored. When there is a superfluous number of electrons forced into such a reservoir the pressure becomes so great that it discharges



The principle of self-inductance is shown in the diagram at the right. The unit of inductance, called a henry, was named for Joseph Henry, left, who made many important magnetic discoveries.



Capacitor discharge is like instant deflation of a balloon.

and they all rush out like water through a broken dam.

A condenser might also be compared to a toy balloon. As air is blown into it, the balloon swells until finally it will hold no more and the air and pressure can be instantly released. The filling of the balloon is similar to charging a

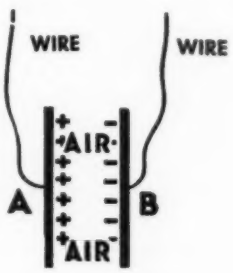


Diagram of a simple air condenser.

condenser and the instant deflation similar to a condenser discharge.

A simple condenser consists of two plates of conducting material separated by air or by some insulating material such as mica or glass. The capacitance (electron capacity) of a condenser is determined primarily by three factors—first, the total area of plate surfaces subjected to a potential difference (voltage); second, the space between these surfaces; and third, the dielectric (insulating) material or substance which separates the surfaces.

It should be remembered that current does not flow *through* a condenser, but rather *into* it and then *out* of it.

Capacitance in an alternating current circuit has the opposite effect of inductance in that it causes the current to *lead* the voltage. This means that the current will reach the peak of its flow before the voltage reaches its peak pressure. Later on, a practical and common use of capcitance to offset the lag of inductance in a two-lamp fluorescent circuit will be described.

The unit of capacitance measurement is called the farad (named for Faraday), but because it is so large, the microfarad (one millionth of a farad) is more commonly used. One farad is the capacitance of a condenser in which a charge of one coulomb produces a one-volt potential.

Power Factor

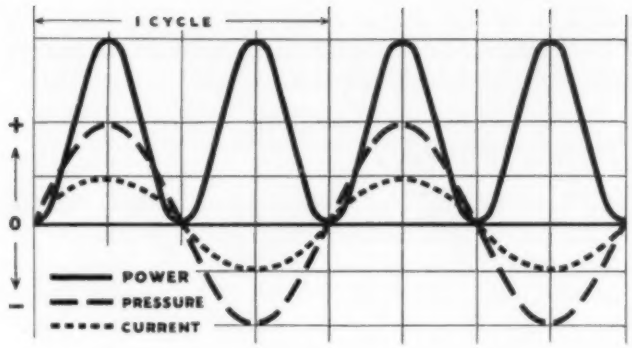
Prior to 1939, Power Factor was a subject which concerned only power plant engineers, or the manufacturers of rotating electrical machinery and induction devices. During that year, however, the use of fluorescent lamps, which have inductance in their circuits, became quite widespread and people who used them began to hear about power factor and ask for an explanation.

There have been many explanations of power factor presented to the general public but most of them have failed to be completely understood by the layman, partially because the necessary background of magnetic inductance has been lacking. It is hoped that the reader, having read this far, will have acquired that background of understanding because with it, the explanation of power factor is somewhat easier.

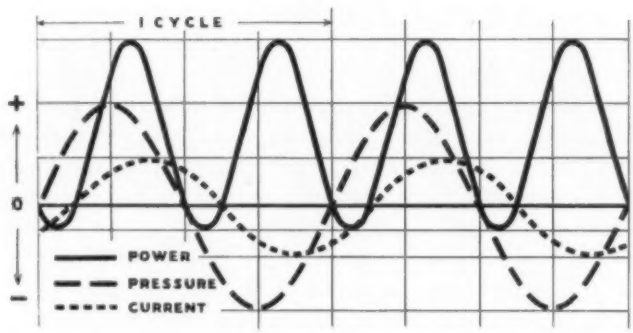
It has been explained with a diagram how the voltage or pressure of an A. C. system builds up from zero to a maximum value in one direction and diminishes to zero again, and then does the same thing in the opposite direction to form what is called a sine wave. It also has been indicated that the current flow follows the same schedule of rise and fall. However, it was pointed out under the subject of "inductance" that certain characteristics of the system or circuit may cause the current peak to occur after the voltage peak, or *lag* behind it. Furthermore, it has been explained how capacitance in the circuit will cause the current peak to occur *ahead* of the voltage peak or *lead* it.

The power factor of a circuit is said to be 1.0 or unity, when the two peaks occur simultaneously. But when inductance is introduced into the circuit as with transformers, induction motors, and similar apparatus, and the current peak occurs after the voltage peak, a *lagging* power factor exists since the power drawn by the apparatus actually is less than the product of the voltage and current (amperage). The ratio of what is actually is to what it should be, is called the *power factor*.

Perhaps a clearer understanding can be obtained by studying the two curves. Curve A represents a condition of unity power factor, that is, the voltage and current peaks occur at the same time so the power peak, being the product



Curve A—unity power factor



Curve B—lagging power factor

of the two, must also occur along with them and always be positive.

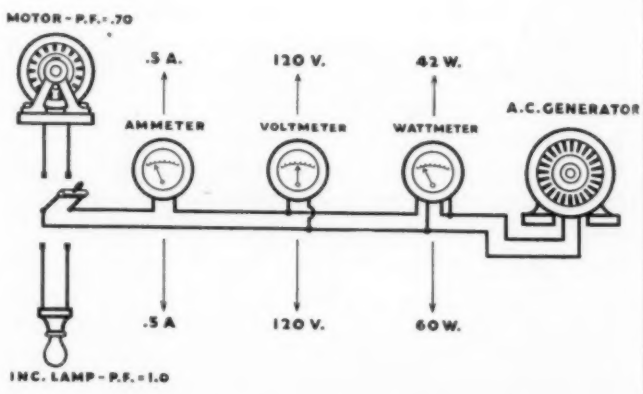
But in curve B, we find the current lagging after the voltage which means that not only do their peaks occur at different times, but likewise their zero values. Now since a figure multiplied by zero gives a product of zero, it can be seen that whenever *either* the voltage or current is at zero, the power value *must* be there also. Furthermore, whenever the voltage shows a positive value at the same time that the current shows a negative value (or vice versa), the power value must be negative. In effect, this means that the device which is making the circuit inductive should be using more power than it actually is since a portion of it is negative.

In order to complete an understanding of power factor it might be well to consider a circuit in which current, voltage and power readings could be taken for either resistance or inductance devices. The diagram shows a circuit supplied by an A.C. Generator, in which an ammeter, a voltmeter and a wattmeter have been connected. The load can be either a small motor or an incandescent lamp, depending upon which way the switch is thrown. Let us assume that the switch is thrown downward to make the lamp light, and the meter readings taken. First, we see from the ammeter that the current flow is .5 ampere. Next we find from the voltmeter that the A.C. Generator is producing a pressure of 120 volts. Then, to find the power or load (wattage), the two readings multiplied together will give 60 watts, which we would find is also indicated by the wattmeter. There is, therefore, a 60 watt lamp burning in the socket.

Now let us throw the switch the other way, shutting off the lamp and starting a small motor. Again we find from the ammeter that the current flow is .5 ampere, and that the voltage from the generator is the same 120 volts, but that the wattmeter actually shows only 42 watts instead of the product of amperes and volts, as before. This difference of 18 watts of power cannot be *lost* because enough current is flowing and enough pressure is there to produce it. Where then, does it go?

The answer is found in curve B. While the motor draws power from the line as indicated by the power wave or curve, it will be seen that part of the wave is below the zero line or down in the negative region. Perhaps the best way to comprehend power of "negative" value is to think of it as being returned into the circuit by the motor after being used.

The 42 watts, as indicated on the wattmeter, is, therefore, the actual power, whereas the power used ought to be the product of the volts and amperes. For that reason the power drawn by a circuit containing inductance, such as a motor,



Circuit for power factor calculation

is measured as it should be, in "volt-amperes" or "kilo-volt-amperes" for larger loads (K.V.A.), instead of watts or kilowatts.

Since what the power actually is, is indicated by the wattmeter, and what it ought to be is the volt-amperes, power factor can be expressed as:

$$\frac{\text{Watts}}{\text{Volt-Amperes}}, \text{ or for larger loads } \frac{KW}{KVA}$$

Therefore, the power factor of the motor in the diagram, as indicated by the readings found on the meters, would be:

$$\frac{42}{60} \text{ or } .70 \ (70\%)$$

The *leading* power factor of a circuit containing capacitance is determined and calculated in the same manner. For commercial purposes, a meter is used to obtain either lagging or leading power factor data directly.

Chapter 5

Reactance—Inductive, Capacitive and Total

The counter electromotive force (previously explained under that heading) resulting from the self-inductance of a device in an alternating current circuit, opposes the flow of current in that circuit the same as a resistance does. When the circuit contains *only* such opposition, that is, no resistance or capacitance, it (the opposition) is called *inductive reactance* and is measured in ohms.

Capacitive reactance is also an opposition to the flow of current in an alternating current circuit but it is that which is established by a capacitor or condenser when there is no resistance or inductance. It also is measured in ohms.

Total reactance is just what the name implies, that is, it is the combined inductive and capacitive reactance when the two are in series in an A.C. circuit opposing the flow of current.

Impedance

When in an alternating current circuit there is also a resistance in series with total reactance, the total opposition to current flow is called the *impedance* of the circuit.

The methods of computing reactances and impedance are a little beyond the intended scope of this treatise, but they are available in current engineering handbooks.

Resonance

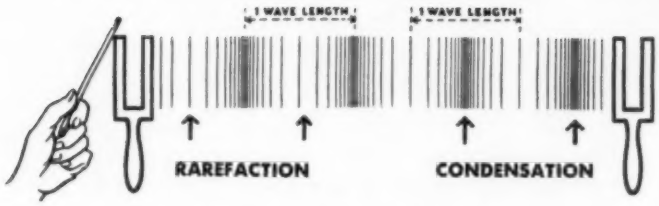
The term "resonance" is commonly associated with sound. Nearly everyone has had the experience of striking a note on a piano and hearing a piece of paper on the music rack or on top of the piano vibrate and produce the same tone. Instead of the paper it may be a vase or dish on the piano or even elsewhere in the room, which vibrates. The reason these remote objects vibrate is because their resonating characteristics are the same as the piano string which is struck, that is, they are in "tune" with each other and the remote object is said to resonate or be in *resonance* with the sound wave produced by the piano string.

Another example might be two violin strings on the same instrument and tuned exactly the same. When the bow is drawn across one of them, the other vibrates and produces the same tone because it is in resonance with the first.

The diagram illustrates the same thing with two identical tuning forks set up some distance apart. One of them, when struck, produces sound waves which travel to the second and cause it to vibrate since its natural frequency is the same wavelength as the first. The two are therefore in resonance with each other because they vibrate at exactly the same frequency.

Under average conditions (in air at 32°F.) sound waves travel at the rate of about 1088 feet per second.

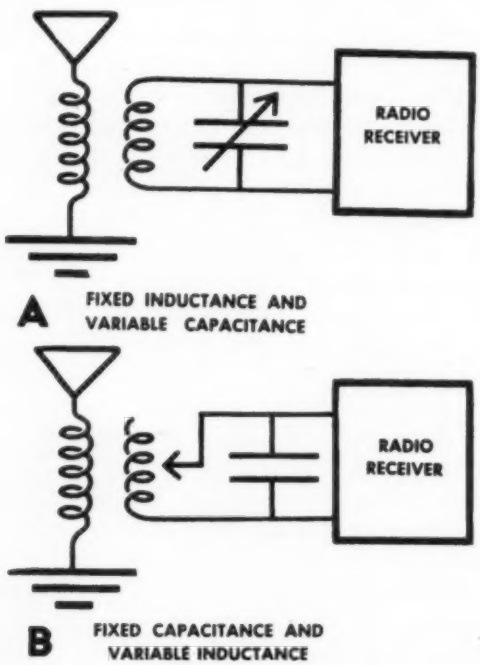
Now when a charged condenser is discharged by bringing the two plates in contact, the electrons rush over from one side to the other with an induction coil also in the circuit, too many of them will get over with the first rush due to the inertia characteristics of inductance, thus leaving one side with too few. Consequently, the condenser discharges again, reversed, so that some electrons rush back again. This "see-saw" action continues a few times and gradually dies out. Such oscillations are very rapid, the fre-



Resonance in sound waves, illustrated by use of two tuning forks which have the same frequency (pitch).

quency being sometimes as high as two million a second or more.

An electrical circuit, which is made to oscillate in this manner, sends out or radiates electromagnetic waves into space that are somewhat similar in characteristics to the sound waves just discussed. They travel at a much higher speed of approximately 186,000 miles per second, however, which is also the speed of light and other types of radiant energy. Furthermore, they do not depend upon air (or a solid or liquids) as a medium of transmission, such as sound waves do. There is a definite relationship between the velocity, wavelength, and frequency of these waves in that the velocity, in meters per second equals the product of the frequency (oscillations



Practically the same principle as the tuning fork is used in radio broadcasting and reception. The receiver is "tuned" or made to resonate, to the frequency of the transmitter.

per second) and the wavelength in meters. This is expressed as:

$$V = NL = FX$$

F — Frequency in cycle per second
X — Wavelength in meter
B — Velocity

It will be recalled that radio broadcast wavelengths are expressed in meters.

Two electrical circuits can be "tuned" or made to resonate if they can be adjusted to the same frequency. This is the basic principle of all radio transmission and reception. The adjustment is made in the receiver and we speak of it as "tuning." The change in tuning or resonance can be accomplished in the receiver by varying either the capacitance (condenser) or inductance.

To vary the capacitance it is only necessary (as explained previously) to change the effective area of the condenser plates, while the inductance can be changed by varying the effective number of turns in the coil—less turns resulting in a decrease in self-inductance and more turns in an increase. Such variable condensers and coils are found in all radios.

Resonance plays an important part in electrical circuits containing gaseous discharge lamps, fluorescent lamps and other electronic devices. It will be discussed further later on.

Harmonics

Since the electromagnetic waves generated by an oscillating electrical circuit can be compared in a general way to sound waves from the standpoint of resonance, it is reasonable to expect that other characteristics of sound waves will be present in electromagnetic radiation.

Any vibrating string produces, in addition to its primary or fundamental tone, several *overtones* which may be higher pitched and of less volume. Assuming that such a string vibrates at the rate of 220 oscillations a second, there are also several overtones present at 440, 660, 880 and so on, becoming more faint as their pitch becomes higher. This fundamental tone along with its overtones is called a harmonic series.

The fundamental frequency of an oscillating electrical circuit also is found to have its electromagnetic "overtones" which likewise are called harmonics.

Harmonics in an electrical system manifest themselves in a very decided manner, and frequently present difficult and involved problems. Further technical discussion of them would be out of place here, but the reader should at least be aware of their existance and general character.

TO BE CONTINUED

In October, and in following issues of WHOLESALER'S SALESMAN. For table of contents and chapter summaries see the July 1943 issue.

By Alfred Byers, *Secretary*
National Electrical Wholesalers Association

News Notes From N.E.W.A.

N.E.W.A.'S ACTIVITIES AT WASHINGTON

During the past month there have been several important developments in Washington having a definite bearing on this industry. These have necessitated several special trips by Managing Director Pyle, who has been keeping in close touch with the changing Washington situation.

N.E.W.A.'S EXECUTIVE COMMITTEE TO MEET

The association's Executive Committee will meet at the Hotel Pennsylvania in New York—October 26th and 27th, 1943. The Management Committee will be included among those who will attend.

Since the association's highly successful War Conference at Buffalo in May, the Management Committee has been meeting regularly to consider important current matters of association and industry interest.

The two days' sessions will be devoted to the consideration of important matters in the general interest of the association. This will be the first meeting to be attended by the executive committeemen elected at the Buffalo War Conference.

ELECTRONICS COMMITTEE SURVEY

Mr. Percy Stern, Chairman of the association's Electronics Committee, reports that according to the survey recently completed by his Electronics Committee, electronics products from a distribution standpoint particularly, are a current subject of interest to many members.

The recently completed survey of the members inquired as to whether or not electronics devices are included in members' post-war selling plans; the extent of customers' interests in electronic devices as so far expressed; and selling and service plans members may now be making or considering. Interesting information has been developed by the Electronics Committee by means of the information contributed by the many members cooperating in this survey. All of these data are being compiled into a composite report which will eventually be released to the entire membership by this committee.

In view of the rapidly growing importance of "electronics" due to the impetus given it by war-time developments it has been stated repeatedly that electronics will provide many valuable contributions to better post-war living. Believing that the electrical distributor logically has a definite interest in present developments the committee felt that the information developed by its survey will prove helpful to all members in considering what may be their own interests in this new and rapidly growing field.

N.E.W.A. MAKING POST-WAR PLANS

The association's Post-War Planning Committee consisting of Herbert Metz, Graybar Electric Co., Inc., Chairman, E. B. Ingraham, Times Appliance Company and L. E. Latham, E. B. Latham and Company, has issued its initial report to the membership. In that report, the committee made a number of very valuable suggestions which members may follow to advantage in making their individual plans for their own post-war operations.

The committee has held several meetings and still more are planned. The subject has proved intensely interesting to the committee members themselves and to others who have participated in some of their discussions. Many ideas and suggestions have resulted from the committee's work to date that are of value to the entire membership of N.E.W.A.

Mr. E. B. Ingraham, chairman of the Appliance Sub-Committee has announced the other members of his committee as follows: Messrs. R. J. Brown, General Electric Supply Corp., Bridgeport; C. S. Powell, Graybar Electric Company, Inc., New York; Robert Beller, Beller Electric Company, Newark, New Jersey. Expectations as to appliance merchandising from a post-war standpoint is the specific subject assigned to this Sub-Committee. Its members are thoroughly familiar with the merchandising of electrical appliances and have a broad perspective of the field gained through their own individual experiences. The association here again looks for a most helpful fund of information to result from the committee's studies and which every member undoubtedly will find valuable.

APPLIANCE REQUIREMENTS SURVEY

The association's survey of civilian requirements of electrical home appliances as reported on this page last month was a very successful undertaking so far as the number of reports from dealers throughout the nation was concerned.

All returns, which numbered well up in the thousands together with detailed summary of all of the information furnished was delivered personally by the association's secretary to the Wholesale and Retail Trade Division of WPB at Washington on August 3rd. The association's special committee, headed by Mr. H. B. Donley, Westinghouse Electric Supply Company, performed in this instance an excellent service both for the authorities in Washington who are giving attention to civilian requirements and to the indusrty at large.

We have been highly complimented by the WPB for doing a splendid piece of work. A copy of this survey has been sent by Mr. Kenneth M. Keefe, Director, Wholesale and Retail Trade Division, WPB to Mr. Arthur Whiteside, War Production Board Vice-Chairman, who is head of the Office of Civilian Requirements.

IN BINDING

Aviation—A Progress Report

The Lessons of War Become the Key to a Richer Peace

TUNISIA, PANTELLERIA, SICILY—stepping stones to momentous events! But that is not all. For they spell out across the blue waters of the Mediterranean a pattern of invasion that has progressed far since last summer's first major Commando operation against the French coast.

From Dieppe, you remember, too many of the raiders never got back. But in Tunisia, and on through Sicily, the Allied might plowed inexorably forward, winning objective after objective at a surprisingly low cost in casualties. Air supremacy over the battlefield? Yes. But we have learned, too, how to save lives and shorten the war by strategic air bombardment as a prelude to invasion.

Thus the bombardment plane—rarely seen by the doughboys on the fighting fronts—is destined to save their lives by hundreds of thousands in the decisive attacks that are to come. This fact is confirmed by the cold calculations of the responsible strategists. It will give renewed courage and confidence to every member of the armed forces and of the home fronts throughout the United Nations.

For instance: thorough strategic bombardment of an objective reduces by nearly fifty per cent the surface forces required for invasion. Anticipated losses are reduced from more than fifty per cent of the original ground force to about twenty per cent. Precision bombardment—as used on railroad objectives in Rome—reduces this percentage of loss still further when it is followed by offensive action on the ground.

This is the fifteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

The inference is clear. Effective prosecution of the war will require smaller ground combat forces and much larger air forces than some of our strategists once thought.

Our most urgent need, then, is for ever-mounting fleets of aircraft. And, fortunately, this is just what we are getting. The American aircraft industry now is producing as many airplanes as all the rest of the world combined. In 1938 we made 100 planes a month. Now we make three times that many in a single working day. By the end of 1943, our production rate will be about 10,000 a month.

But at this stage of the war, types of planes are more important than mere numbers. In the early months the program was heavy, and properly so, with single-engine trainers. Then, as training planes accumulated, the emphasis shifted to heavier types. Now we are turning out multi-engined bombers at a rate that is the envy of the entire world. Some months ago the President revealed that we were manufacturing 500 long-range bombers every month. The figure was conservative even then. And soon we shall be producing planes of this one type at a rate adequate to replace the normal losses of a fleet of at least 1000 American heavy bombers operating as continuously as the weather will permit.

A glimpse of the poundage production may help us still further to evaluate the miraculous achievements of the aviation industry as a whole. It was 89,000,000 in 1941 . . . 291,000,000 in 1942 . . . 911,000,000 in 1943 . . . and 1,417,000,000 in 1944

– if we need it. There you have the magnificent record of the American aircraft manufacturing industry – a monument to the cooperation of industry, labor, government, and to all-out teamwork between the aviation industry and those other industries which have converted their facilities to the manufacture of airplanes.

What of our enemies and our Allies?

German production probably has flattened out at 2500 a month – with downward revision in immediate prospect. Japan may be able to produce as many as 1000 planes a month – until we get our new long-range super-bombers in sufficient numbers to whittle down that figure. Italy may be able to turn out her 500 a month – for a little longer. At best the maximum Axis monthly total is 4000.

Add to our monthly score of nearly 8000, a total of approximately 4000 for Britain, Canada and Russia, and the United Nations score comes to 12,000 monthly. There we have a three to one advantage for our side. And between our own rising production and the brilliant operations of our bomber commands we should soon boost the ratio well above that figure. Therein lies the certainty of continued and growing air superiority over all the far-flung battlefields.

The critics of American airplane quality have been silenced ever since the ratio of enemy combat losses to our own on bombardment missions surpassed four to one. In the Pacific where our heavily armed and armored planes are knocking off the desperately stripped racing craft of the Nipponese, enemy losses often run as high as eight to one or more. In the Mediterranean theater, where the Italians were abandoned by their Allies, the story is much the same. Only in the well-defended homeland of the Nazis do we sometimes drop below the average, but even in those rare instances the ratio is still well in our favor and the effectiveness of our bombardment is adding constantly to our margin.

* * *

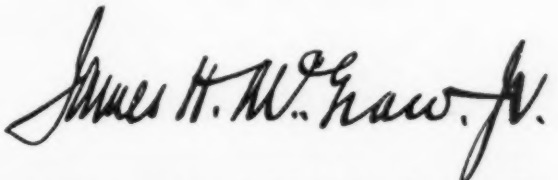
Behind the production lines the battle of research and design still rages. In many a laboratory night-shift, on many a secret test field, new and terrible surprises for the enemy are in the making. Superbombers, destined for Tokyo, have long since passed out of the design stage and the Japanese may learn about them almost any day. New discoveries, designed to sow swift and silent devastation, are farther along than our enemies believe. No longer will fog or storm or night be permitted to fight on the side of our foes.

The men of science who are toiling to broaden the horizon of our knowledge stand today on the threshold of discoveries that have been sought for centuries. New reservoirs of power may soon exert a profound influence in many fields of technology and through them on our way of life.

Once the war is won these new discoveries will be translated into better living. No longer will countless thousands spend their lives within their own communities or countries. New efficiencies in transportation will bring world travel within the reach of many who once had to stay at home. New family vehicles will navigate the skyways as easily and safely as the highways. Already more than a dozen manufacturers of airplanes, ships, automobiles, and electrical equipment are designing, building, or flying rotary-winged aircraft such as the helicopter or autogyro to meet the needs of tomorrow's families. New and safer aircraft of the fixed-wing type are ready for production as soon as materials become available.

The quality that now makes each of our war planes worth so many of those built by our enemies will be translated into the sturdy reliability demanded by peacetime operation. The devices that seek out and find our enemies behind the veil of fog or darkness will, after the war, reduce weather hazards to the point where they will be no greater in the air than on the ground.

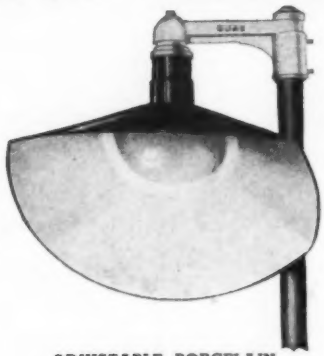
Science and industry will continue to do their jobs and do them well. But if the world is to be made a better place for men to live in, statesmanship must not fail to do its part.



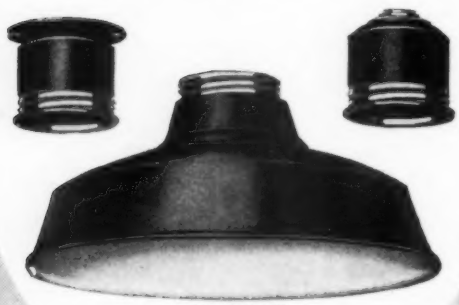
President, McGraw-Hill Publishing Company, Inc.

QUAD

LIGHTING UNITS



ADJUSTABLE PORCELAIN ENAMELED FLOODLIGHT



No. 1184-M
RLM THREADED
DOME REFLECTOR

RLM

★ QUAD Lighting Units have unlimited possibilities . . . for good business and good lighting. The stress placed on specialized lighting today demands the most modern and most flexible lighting units—QUAD Units fill the bill for these requirements, no matter how exacting. Be ready for any industrial or commercial lighting job with QUAD Units.

QUAD—for today and for tomorrow—

QUADRANGLE MFG. COMPANY

Mfgrs. of Incandescent and Fluorescent Lighting Equipment

32 SO. PEORIA ST. CHICAGO, ILL.

WPB Orders

(Continued from page 97)

"A limited number of flashlight batteries are now available for civilian needs.

"As long as this supply lasts, wholesale distributors may make application on Form WPB-547 (PD-1X). A rating of AA-5 will be assigned on approved applications.

"These batteries are to be sold to retailers with no rating required, and resold to civilians or other purchasers of non-rated requirements.

"Wholesalers and retailers must appreciate that there is a critical shortage of flashlight batteries and limit their sales in a manner that will spread the supply they receive as thinly as possible.

"The distribution of these batteries, for civilian and other non-rated requirements, should not be confused with the Farm Program under Order M-330 or PR-19.

"Wholesalers selling farm outlets should continue to apply on WPB-547 (PD-1X) using the certification specified in Order M-330. A rating of AA-5 will be assigned on approved certified application. Wholesalers' orders on manufacturers, carrying the M-330 Order can only be sold on certificates from farm retail outlets who, in turn, may only sell to the farm on certificates as called for in Order PR-19."

Inventories—Filing WPB-547 Properly

A recent report from the War Production Board states that several hundred WPB-547 forms are being returned to applicants each week because of failure to fill out the forms correctly.

Unless the blanks, used to obtain priority asistance for replenishment of inventories, are filled out carefully and all information which is called for is provided, no action can be taken on the application and there will be no alternative but to return the forms, the Wholesale and Retail Trade Division announced.

One of the major causes for rejection of applications, it was stated, has been the failure to insert at the top of Column C, Section III of the

application the amount of inventory held by the individual distributor six months prior to the date of filing. It was pointed out that the applicant has the option of giving an inventory figure for any date between 6 months and 18 months prior to the date of filing the WPB-547 application.

Likewise, officials said that a large number of applicants fail to fill in Section II of the form properly, calling for sales and inventory figures for their entire business.

It was emphasized that distributors will facilitate expeditious handling of their applications by reading carefully and following the instructions on the reverse of the form.

Further WPB-547 Instructions

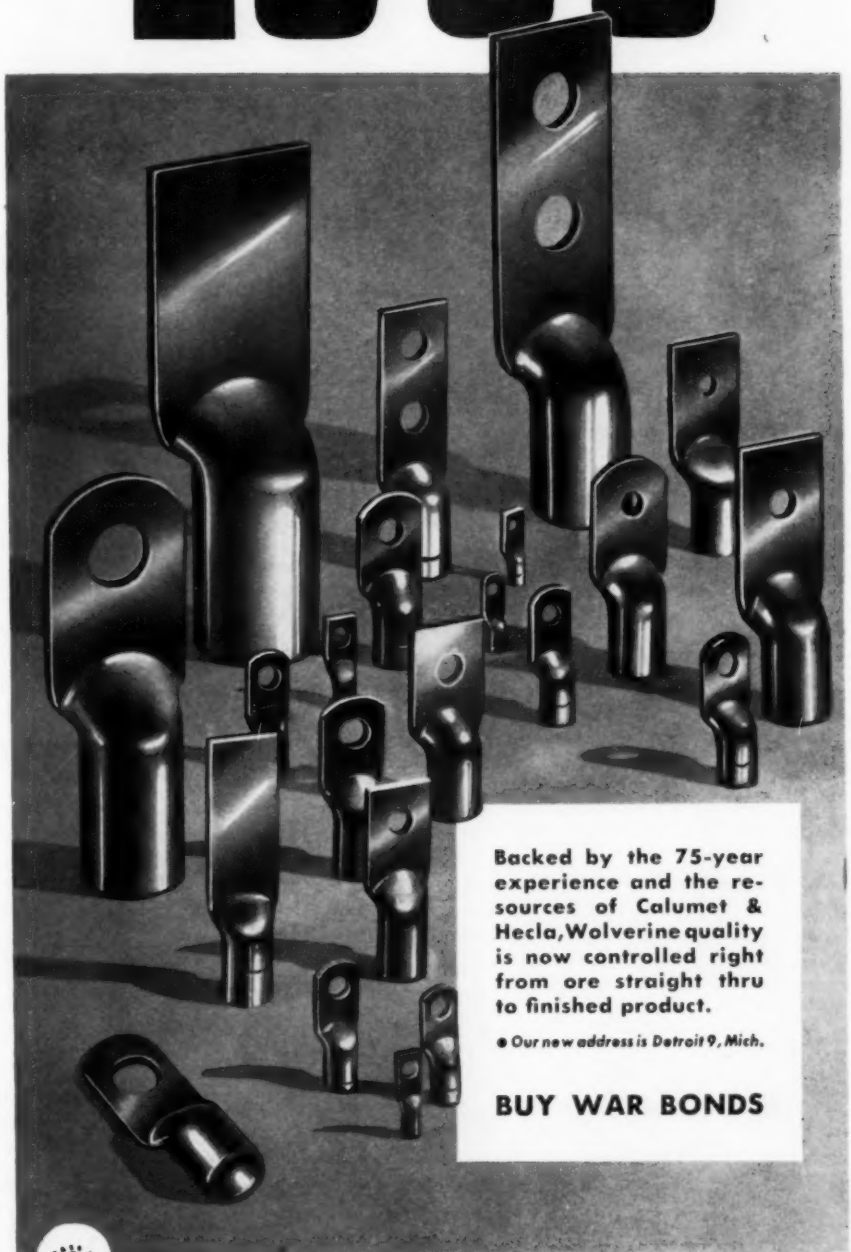
The Wholesale and Retail Trade Division also reported that "distributors using Form WPB-547 frequently make the mistake (when describing the type of material required) of using a general term such as 'Tape,' 'Motors,' or 'Fixtures.' The result is that applications are either denied, or the ratings assigned are not as good as they might be if the applications were itemized.

"To save paper work, the War Production Board, at the moment, is accepting WPB-547 applications for 'Wiring Devices.' The general term is practical in that case because the line is also covered by only one order (L-277). Beyond that the Board is cognizant of the thousands of items eligible under that classification and favors saving of the paper work that would be necessary if itemization were insisted on. However unfortunate, the same practice cannot be used on other items.

"On tape, for instance, the ratings available at the moment on WPB-547 are AA-4 on Friction Tape and AA-2X on Rubber Tape. Therefore, when an application merely describes the product desired as 'Tape,' the analyst must play it safe and assume Friction Tape is the product desired. When that happens and rubber tape is required, the applicant is not enjoying the best rating available.

"On material such as Motors, Controllers, Safety Switches, etc., several limitation orders are involved, depending on HP, Amperes,

SOLDERING LUGS

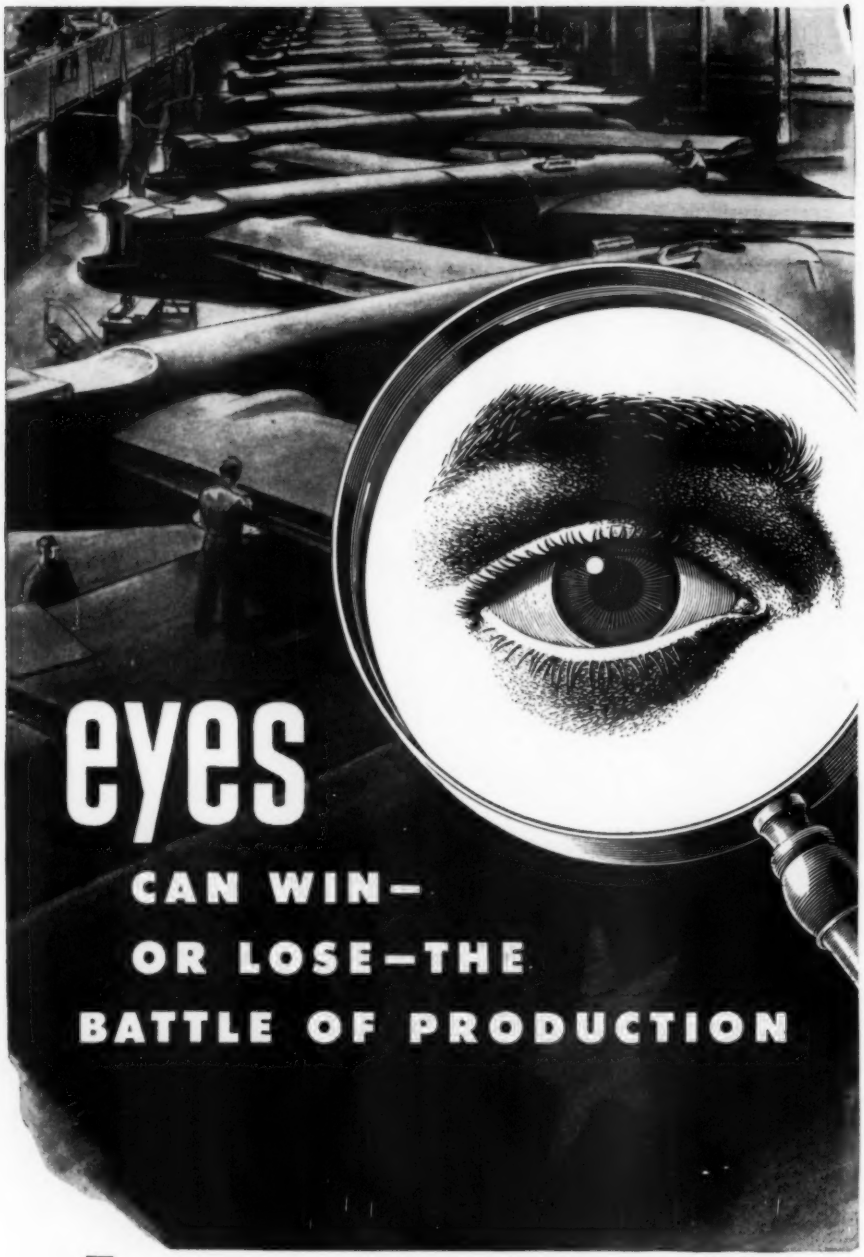


Backed by the 75-year experience and the resources of Calumet & Hecla, Wolverine quality is now controlled right from ore straight thru to finished product.

• Our new address is Detroit 9, Mich.

BUY WAR BONDS

CALUMET AND HECLA CONSOLIDATED COPPER COMPANY
WOLVERINE TUBE DIVISION
Seamless Copper — Brass
1425 CENTRAL AVENUE DETROIT, MICHIGAN



Eyes are *that* important! For they control almost 90 per cent of all human motions.

Small wonder that busy war plants lay so much emphasis on proper illumination—to help the eyes and hands work faster, more accurately—to increase production for Victory.

Goodrich illuminating engineers are busy solving lighting problems for industrial management. They are ready to help you, *now*, while there is still time. *Goodrich industrial equipment is sold only through electrical wholesalers.*

RLM

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4610 BELLE PLAINE AVENUE, CHICAGO, ILL.

etc., and the ratings must necessarily vary. Therefore, when an applicant merely specifies 'Motors,' or 'Safety Switches,' the analyst has no alternative but to deny and return the application. The 'aggravation' suffered by distributors in these cases can be avoided if priority clerks are instructed to itemize all WPB-547 applications with the exception of 'Wiring Devices.'

"It is also necessary at this time to again stress the fact that ALL questions on WPB-547 MUST be answered. Failure to do so merely results in return of the application. Time and expense will be saved if priority clerks are again impressed with the necessity of answering ALL QUESTIONS on the form."

Marine Electric Motor Supply Sufficient

Requirements for electric auxiliaries to be used aboard ships under the Government's shipbuilding program can be fully supplied by the manufacturers of such equipment, the Integral Horsepower Motor Industry Advisory Committee of the War Production Board reported to the Government officials at a recent meeting in Washington.

The committee expressed its opinion that it would not be necessary for the Government to change its specifications to require steam auxiliaries in place of the electric types inasmuch as, the committee held, capacity for electric auxiliaries is adequate.

Motors—Interpretation Of Order L-123

The sale of a fractional horsepower motor to replace one broken down is considered a maintenance and repair transaction, where the broken one is taken in by the repairer.

This transaction, according to an interpretation issued by the War Production Board, comes within the exemption provided by Order L-123, covering the delivery of maintenance and repair parts.

Radio Jobbers' Wire Stocks Released

The WPB has called to the attention of radio jobbers the fact that

they may apply for relief to the War Production Board on Form PD-470 (WPB-1161) listing frozen stocks of copper wire mill products by amounts, sizes and types which cannot be sold in accordance with CMP No. 4. It was pointed out that in the event that an application should be approved by WPB, copper wire sold under such authorization cannot be replaced in stock.

Wire and Cable Prices Adjusted

Provisions for the individual adjustment of ceiling prices for producers and sellers of wire, cable and cable accessories similar to adjustments recently made available to manufacturers of essential machinery were announced by the Office of Price Administration to be effective on August 4, 1943.

The action, contained in Amendment No. 4 to Revised Price Schedule 82, is confined to cases qualifying under rigid tests of essentiality of the seller and the product.

Since wire and cable are not consumers' articles, any increase in price granted by the OPA in accordance with this action would not be reflected in the cost of living. Any increase in the cost of producing consumers' articles made of wire or cable would be infinitesimal and would not affect consumer price levels, the OPA stated.

The tests of essentiality are spelled out specifically in the amendment as are various cost, price and competitive data factors which OPA will consider in reviewing the applications for adjustment.

Generally, the new provisions will permit OPA to adjust prices after it has ascertained that ceiling prices are at such a level that supply of vital wire or cable is impeded or threatened provided that the adjusted price will not cause an increase in the cost of living.

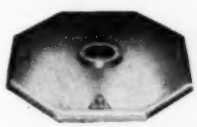
Used Motors to Scrap —Committee Suggests

A program for the scrapping of unrepairable old electric motors was urged to the Government by members of the Used Electrical Equipment Dealers Industry Advisory Committee at a recent meeting with WPB officials in Washington.

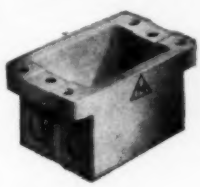
ILLINOIS
Completely Insulated
ALL PORCELAIN
WIRING SYSTEMS

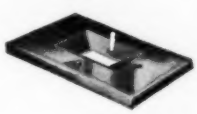
for HOME, COMMERCIAL AND INDUSTRIAL WIRING Conserve STEEL, ZINC, COPPER, RUBBER

OUTLET BOXES
Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes and mounting screws. High mechanical and electrical efficiency.



SWITCH BOXES
Insure greater safety in wiring and the elimination of all grounding hazards. Made of best quality white porcelain. Metal inserts are placed in two holes of the switch boxes for receiving screws of standard switches, plugs, outlets, etc. Knockouts for single wires, also for cables. Specify and use them.





STANDARD TUBES
In sizes ½ to 48 inches, 5/16- to 3-inch diameter in following types: unglazed, glazed, split, floor, split floor, headless, curved end, cross-over split, and cross-over. Diameters all uniform both inside and outside.

KNOBS
Cement coated — nail — genuine leather-washer — code standard. They don't chip when driven in and they stay in place.

TOGGLE SWITCH PLATE
All porcelain with beveled edge and decorative pattern on face.

CLEATS
Standard one, two, and three-wire types.

● Not only because porcelain saves vital materials is it valuable today but because these systems give you highest standards in results and offer your customers permanent wiring. Porcelain systems are safe, easy to install, and adaptable to practically all wiring plans and layouts. Grounding is unnecessary. No rusting or corrosion. Install ILLINOIS All Porcelain Wiring Systems the next time you have a wiring job.

Look for this Trade Mark

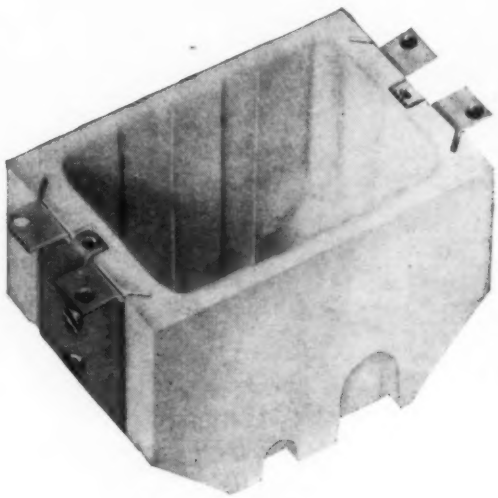
ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS

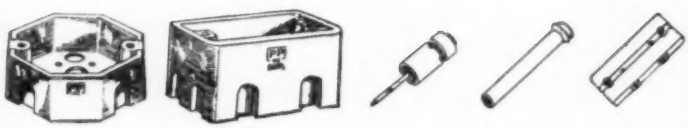
MISSING

4,000,000 Tons Steel

Needed to Meet Fourth Quarter Requirements

(WPB Release 4027, August 10, 1943)





ELECTRICAL WHOLESALER'S COOPERATION NEEDED TO CONSERVE CRITICAL MATERIALS

You electrical wholesalers have done a marvelous job in speeding essential war construction. Your help is needed more than ever however, in guiding purchases of electrical materials so that critically needed metals can be conserved.

Porcelain Outlet Boxes and other non-metallic wiring materials such as Knobs, Tubes, Cleats, Wood Back Racks, are REQUIRED by all Government directives on wiring construction to conserve critical materials, and electrical jobbers can display their patriotism and contribute in the utmost measure to the War Program by stocking and pushing the sale of these materials. By so doing you will also provide greater safety and durability for electrical wiring installations while building profits and business prestige for yourself.

PORCELAIN PRODUCTS, Inc.
FINDLAY, OHIO

News

(*Continued from page* 34)

the critical situation in wholesale inventories of certain civilian supplies hastened this action in transferring the division. Department of Commerce figures are quoted to show that dollar value of wholesalers' inventories dropped $600,000,000 in one year, which decline actually is more serious than the figures indicate since totals are not adjusted to the increased dollar value of each item. At the same time, retail stocks had dropped by $2 billion.

Pick Labor Committee For Wholesaling Group

An industry committee for the warehousing, wholesaling and other distribution industries has been appointed and convened by L. Metcalfe Walling, administrator of the Wage and Hour Division of the U. S. Department of Labor.

The committee was instructed to meet late in August in New York to investigate conditions in the industry and recommend to the Administrator minimum wage rates for all employees in the industry, in accordance with the provisions of the Fair Labor Standards Act of 1938.

The committee as selected contained 21 members, with each of two groups of seven representing their branch of the industry—the employees and the employers, and the third seven representing the public.

Seek Clause For Closing War Contracts

Recent reports from Washington indicate that no decision has been reached on the proposal to arrive at a single contract termination clause to be used in all supply contracts, but it is believed that several drafts have been sent out to industry and government executives for comment.

The newly proposed clause includes extensive changes in the provisions relating to subcontractors and in the provisions for compensating contractors substantially along the lines of the formula now used by the War Department.

Three alternate bases for computing compensation to be made to war contractors whose contracts are terminated prior to completion are expected

in the new draft. One of these will be substantially the Army formula but modified to meet an objection raised by critics that this formula, including the factor of estimated profit which might have been realized had the contract been completed, was too uncertain. In lieu of "estimated profit" the re-draft may substitute a flat 4 percent profit allowance based on costs.

The report indicates also that the new uniform contract clause makes new provisions for allowing depreciation and amortization in arriving at settlements. It is said that contractors may not use the full amortization or rapid write-off permitted under war contract certificates of necessity.

McClelland to Head Sales for Anchor

Harold W. Goldstein, president of the Anchor Distributing Co., Pittsburgh, has announced the appointment of Wm. C. McClelland as sales manager of that concern.

Mr. McClelland was formerly sales manager of the appliance division of the J. A. Williams Company of Pittsburgh, and had been with that company since 1930. Prior to that he was associated with the Kelvinator-Leonard

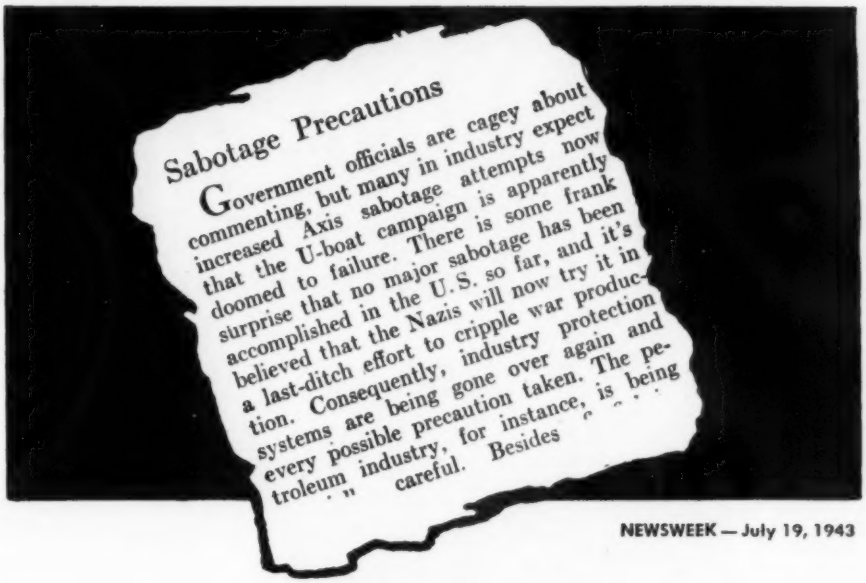
© Bachrach

Wm. C. McClelland

Company of Pittsburgh and the Brunswick Radio and Record Company factory branch in that city.

In his new position, Mr. McClelland will be in charge of merchandising the company's war-time substitutes for their electric appliance lines —ice refrigerators, insulation, gas and coal heaters, ranges, toys, etc. He will also have charge of post-war planning of sales of the electric lines.

Mr. S. I. Lasner, formerly sales manager for Anchor, is now assistant to the president.


Sabotage Precautions
Government officials are cagey about commenting, but many in industry expect increased Axis sabotage attempts now that the U-boat campaign is apparently doomed to failure. There is some frank surprise that no major sabotage has been accomplished in the U. S. so far, and it's believed that the Nazis will now try it in a last-ditch effort to cripple war production. Consequently, industry protection systems are being gone over again and every possible precaution taken. The petroleum industry, for instance, is being careful. Besides

NEWSWEEK — July 19, 1943

"Nazis May Now Try to Cripple Our War Production"

Sell Protection Against Desperate Nazi Sabotage

Steber No. 3000 or 3100 Open Floodlight. Like the 3200, available with or without light shielding visors.

Desperate efforts to sabotage our production may be made—as Newsweek and government officials suspect. . . . To combat this, floodlighting protection is of greatest value.

Here is your opportunity,—recommend the use of Steber Floodlights for protection of plant areas, railroad yards, refinery and oil storage areas, docks and power plants.

Steber Floodlights incorporate the latest features — with fewer models meeting a greater variety of applications. They include open and enclosed types and may be furnished with shielding visors to prevent "spill-light" (a must feature in Coastal locations). Practical, efficient, and reasonably priced,—the Steber line has had wide acceptance in all parts of the country.

See that you have a copy of Catalog 10 (just off the press) and new 8-page Floodlight Bulletin No. 110 complete with light distribution curves and light shielding devices. . . . Write STEBER MANUFACTURING CO., 2451 No. Sacramento Avenue, Chicago 47, Illinois.

STEBER

FLOODLIGHTS

•

Advertised also in Modern Industry, Electrified Industry, Electrical Equipment, Industrial Maintenance — total circulation,—220,000.

•

No. 1600 enclosed floodlight for 300-500 Watt Lamps. No. 3200 for enclosed floodlight for 750-1000 and 1500 Watt Lamps. Furnished in broad, narrow and medium beam patterns.

Here's Your Postwar Market for KLEIN'S

Since 1857

LINEMEN — electricians — good workmen everywhere are still relying on the Klein's they bought before the war to help them get their important jobs done.

When the war is won, many of these Klein owners will want new pliers and equipment —many others who learned of Klein quality in the Army and Navy will want Klein's also.

There is an extensive postwar market for you in Klein equipment. Make a note now to see that you will be in a position to furnish Klein tools to your customers who want them when the war is won.

Owners of good tools realize the importance of getting the maximum service from the tools they use. To help them secure this service, we have prepared an illustrated booklet on the proper care and use of tools. If you have a customer who would like one, we will be glad to send it.

DISTRIBUTED THROUGH JOBBERS

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
3200 BELMONT AVENUE, CHICAGO

Graybar Plans For Post-War Selling

Post-war planning has been organized at the Graybar Electric Company, and for more than a year committees have been at work studying the various problems which may confront this national electrical wholesaling concern when the country returns to peacetime selling, according to an article in *Printer's Ink* magazine.

Under the chairmanship of one of its general sales managers, Herbert Metz, a "steering" committee of four was formed to coordinate all post-war thinking and to establish sub-committees. Besides Mr. Metz, the steering committee has: Kenneth B. Hopkins, advertising and sales promotion manager; August J. Eaves, sales statistician and priorities; and James A. Mayer, supply sales manager.

The article reported that the sub-committees are studying the following subjects in the light of post-war possibilities:

The markets and market research sub-committee is concentrating much of its study on the relationship of the present 85 Graybar branches to the post-war marketing centers, also on feeling out possible changes in types of customers.

The personnel and employee training sub-committee is reported to be working on plans to insure every employee who returns from the service a job if he wants it.

The new products sub-committee is studying all sources of information to locate possible new products or applications and uses for Graybar-sold products.

A municipality sub-committee is keeping in touch with all communities to learn about their plans for civic improvement.

Sub-committees for appliances and for supply are keeping in touch with all of the company's suppliers in order to be familiar with their post-war plans.

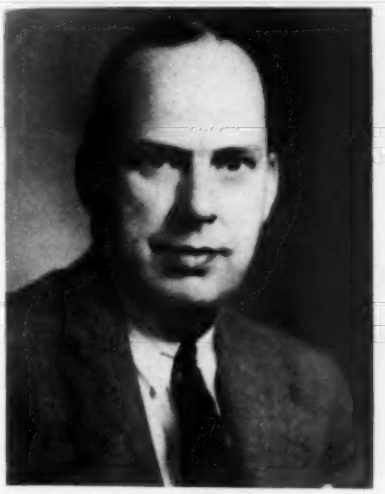
Merit Award To McKibbin

The Order of Merit, the highest honor that Westinghouse Electric and Manufacturing Co., East Pittsburgh, bestows on its employees, has been awarded to John M. McKibbin, manager of the Application Data and Training Department of the company.

Mr. B. W. Clark, vice-president of Westinghouse, presented Mr. McKibbin with a bronze medal bearing a sil-

ver "W" and the inscription "Whom his fellow men delight to honor."

The following citation accompanied Mr. McKibbin's award: "In recognition of the distinguished service of



J. M. McKibbin

John M. McKibbin, for his exceptional talent in preparing and disseminating technical information which influences buying of the company's products; for developing the highly effective application training technique known as the 'product of the month'; and for the imaginative way he has dramatized the obligation of Westinghouse people to increase production of war materials."

New Assignment For "Herb" Benfield

J. J. Mitchell, vice-president in charge of sales for BullDog Electric Products Co., Detroit, has announced the appointment of H. H. Benfield as

H. H. Benfield

eastern division manager of the company. In his new position, Mr. Ben-

Latrobe PRODUCTS

★ FLOOR BOXES ★ WIRING SPECIALTIES ★

HIGH QUALITY

EASILY INSTALLED

No. 110 LATROBE WATERTIGHT FLOOR BOX

Cutaway view shows how tapered unit receptacle fits tapered opening in top of box body. Few parts. Easily installed. Ample wire space inside the box.

No. 284 Nozzle with No. 200 Cover Plate

A double duplex nozzle with ½ in. brass pipe extension—or if preferred ¾ in. pipe extension. A very neat and highly regarded watertight floor outlet.

LATROBE PRODUCTS *are* Quality Products

In thousands of installations through the nation Latrobe Floor Boxes and wiring specialties are serving with notable success. Designed for quick installation they are saving valuable time. Yet their high quality and efficiency place them easily in the forefront in their field. Absolutely tops for all war emergency and civilian jobs.

No. 280 Nozzle

Shown in No. 200 cover plate. Ten amp. 250 volt receptacle. Brass housing, mounted on ½ in. brass pipe extension 3 in. long. May be had with longer pipe extension.

No. 625 Latrobe Conduit Bender

Very sturdy. Made of "Tuf-a-loy" steel. Reversible jaw. Internally threaded socket. Will not break. Will not slip. Will not kink conduit.

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE SUPREMACY LATROBE, PA.

DURABLE

ECONOMICAL

FULLMAN MANUFACTURING CO.

LATROBE . . . PENNSYLVANIA

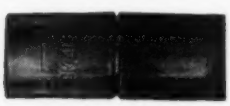
This gives you some idea of the difference in efficiency and RESULTS—when you use the ultra-modern BRIEGEL METHOD of making thin wall conduit connections instead of many old-fashioned methods still on the market.

You conserve critical steel—Briegel fittings are made with 25% less steel than any other fittings on the market.

You save time—just two squeezes with the patented B-M "indenter" (illustrated at right) and a smooth, clean connection is made. No extra turns or twists—no nuts to tighten. Up to 50% saving on precious time!

The Only Tool You Need (Costs just $1.25)

Prompt Deliveries on All Properly Rated Orders!



You save materials—fewer items to buy and handle. MORE PROFIT ON EVERY JOB!

Approved by Underwriters' Laboratories

Distributed by

The M. B. Austin Co.	Chicago, Ill.
Clayton Mark & Co.	Evanston, Ill.
Clifton Conduit Co.	Jersey City, N. J.
General Electric Co.	Bridgeport, Conn.
The Steelduct Co.	Youngstown, Ohio
Enameled Metals	Pittsburgh, Pa.
National Enameling Mfg. Co.	Pittsburgh, Pa.
Triangle Conduit & Cable Co.	New Brunswick, N. J.

BRIEGEL METHOD TOOL CO., Galva, Ill.

AS LONG AS THERE IS ELECTRIC LIGHTING, THERE WILL BE FUSES AND WIRE!

HEY! PUT IN A NEW ROYAL FUSE!

. . and this "Lighting Show" – in print – emphasizes the great contribution such products are making in the present war effort.

ROYAL Wire and Fuses are performing faithfully, at home and abroad.

ROYAL

ELECTRIC COMPANY, INC.

95 GRAND AVENUE • PAWTUCKET, R. I.

field will supervise and direct the activities of the district offices in Boston, New York, Philadelphia, Washington, Syracuse and Buffalo. He has been New York district manager since December 1941, and will continue to make his headquarters at the New York office.

Prior to joining the BullDog organization Mr. Benfield was sales manager of the Steel and Tubes Division of the Republic Steel Company, had long been associated with the application and marketing of thin wall conduit.

Salsbury Now Wesco General Manager

D. M. Salsbury, division manager at the Seattle, Wash., office of the Westinghouse Electric Supply Co., has been elevated to the position of general manager of the company effective September 1st. Mr. Salsbury will hereafter be located at 150 Varick St., New York.

W. M. Jewell, for the past year acting district manager at Detroit, was made district manager to replace Mr. Salsbury at Seattle.

Mr. Salsbury's entire career embraces the electric supply field. He was born in Belleville, Ontario, attended school in Calgary, Alberta. After finishing school he entered the Northern Electric Company in that city and remained there two years before going to Oakland, Calif., to join the supply department of the then Western Electric Company. From there he went to the Valley Electrical Supply Co., Fresno, and then to Electric Railway and Manufacturers Supply Co. as an outside salesman. The latter company was purchased by Westinghouse in 1920.

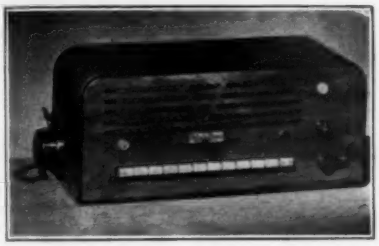
In 1929 he was brought to San Francisco to be merchandise sales manager for Westinghouse Electric Supply Company. Four years later he went to Salt Lake City as manager of Inter-Mountain Electric Co., a Westinghouse subsidiary. In 1939, Mr. Salsbury was made district manager at Seattle, a district which includes also the Portland, Tacoma, Spokane, and Butte, Mont., houses.

Nema Publishes Brush Standards

A second edition of the Carbon, Graphite and Metal-Graphite Brush Standards, publication number 43-85, has been published by the National Electrical Manufacturers Association to supersede the one published in 1934.

The pamphlet consists of 16 pages

AVAILABLE NOW



Talk-A-Phone Inter-Comm Systems

You can answer today's demand of your local defense plants and war industries with America's most complete line of inter-communication systems. Four different systems each available in three distinct types offer a wide range of design and performance. There's a Talk-A-Phone to meet every price and engineering requirement.

Write or wire for complete catalog and prices

Talk-A-Phone Mfg. Co.

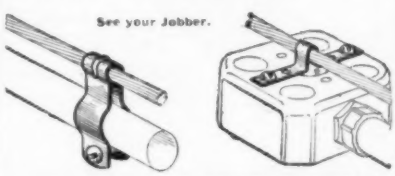
1209 W. Van Buren
Chicago

MINERALLAC

New Practical Unit to Cut Installation Time

● The "Messenger Hanger" and the "Messenger Strap" fill the need for an economical, practical, time-saving unit for use with the new messenger cable type of installation. Mechanically strong, durable, lightweight. They save considerable material and are easily and quickly installed. Our bulletin gives full and complete details—send for it.

See your Jobber.



"Messenger Hanger" for Conduit and Cable
Strong, made of Cadmium Plated Steel or Everdur. Top loop of hanger grips messenger cable to permit conduit to be put in place without falling off.

"Messenger Strap" for Outlet Boxes
Of Cadmium Plated Steel or Everdur. For messenger cable installaton to be used with Mineralac "Messenger Hanger." Fits all standard outlet boxes and ⅜" messenger cable.

MINERALLAC ELECTRIC COMPANY

New York City Office 50 CHURCH ST.
THEODORE B. DALLY
25 N. Peoria St. Chicago

bound, and is illustrated. Copies may be obtained from NEMA at 155 East 44th St., New York City, at 25 cents per copy.

Taylor to Head GE Lamp Works

Z. G. Taylor has been promoted to the post of manager of the East Cleveland (Ohio) Lamp Works war plant, according to an announcement from the Nela Park headquarters of the General Electric Lamp Department. He

Z. G. Taylor

W. B. Gillen

succeeds W. B. Gillen, who has resigned his position as manager of that plant to become manager of manufacturing for GE's newly-formed Tube Division of the Electronics Department.

For a long time, Mr. Taylor has been engaged in GE's lamp making activi-

Ever Break a Socket?

To Avoid Troubles

hundreds of heavy industrials and shipyards are using our

UICO NO. 63310

IMPACT RESISTANT BAKELITE SOCKET

This All Canvas Bakelite Socket is built and proven to last three or four times longer than the ordinary socket. Such long-life dependability is especially essential now as it eliminates frequent reordering and re-installing with accompaning priority problems and slow deliveries.

● **Write for details today on No. 63310 Bakelite Socket.**

THE ORIGINAL MANUFACTURERS of BAKELITE SOCKETS

UNION INSULATING CO.

Factory: Parkersburg, W. Va.
Sales Office: 27 Park Place
New York City

HEXACON ELECTRIC SOLDERING IRONS

Dependable!

Whatever the need—heavy industrial work or extremely light, delicate work—there's a HEXACON electric soldering iron to meet the particular requirements. Included are units for fast production or for service or maintenance use. Screw tip irons, plug tip irons and irons with replaceable and hermetically-sealed elements are available in this complete and diversified line. The performance of HEXACON irons is attested to, by their wide adaptation in Army, Navy and Air Corps applications. Each HEXACON unit is subjected to an insulation breakdown test of twice the intensity required by the Underwriters' Laboratories.

WRITE FOR LITERATURE

Descriptive bulletins, describing the complete line of HEXACON electric soldering irons, will be sent on request.

HEXACON ELECTRIC COMPANY

746 W. CLAY AVE., ROSELLE PARK, N. J.

ties as engineer and manufacturing executive. For several years he was manager of the Cleveland Lamp Works, after which he was appointed manager of the Jackson (Miss.) fluorescent lamp works. He joined General Electric in 1912.

Industry Organizes "Better Care—" Plan

A national program on appliance care and maintenance, with the theme "Better Care—Less Repair," was outlined last month at a Chicago meeting of representatives of manufacturers of home appliances. They met to discuss the program with M. R. Rodger, chairman of the Edison Electric Institute appliance conservation committee.

The program, scheduled to start in January, 1944, will be backed by national and trade advertising of electrical manufacturers, it was announced. Local utility advertising and demonstrations will tie in with the theme. The plans include also window and store displays for 25,000 dealers, and provisions for a "check list" on care of home appliances for distribution to homes by local electrical interests.

Mr. Rodger stated that "While much excellent work has already been done, it is felt that only through a definite national program can the industry hope to meet the coming crisis of electrical appliance service in the home. It is only through augmented consumer education that we can hope to cope with the demands of gradually wearing out appliances."

Meetings in New York and Chicago are planned for early in October.

Cordiner to Assist Swope at GE

Gerard Swope, president of the General Electric Company, has announced the appointment of Ralph J. Cordiner as assistant to the president. Mr. Cordiner, who resigned in June as vice-chairman of the War Production Board, was formerly president of Schick, Inc., prior to which he was manager of the appliance and merchandise department of the General Electric Company.

Mr. Cordiner has been associated with the selling of appliances since his days at college. During his career in this field he has been with the Pacific Power and Light Company and the Edison General Electric Appliance Company in positions on the West Coast. Then, when the heating device section of Edison GE was consolidated

Save Time and You Speed Up VICTORY!

Sherman Solderless Lugs can be assembled in a jiffy, and they make a tight, permanent connection! Extra thread plate for strength. Floating pressure pad attached to screw. Serrated gripping surfaces. Sizes up to 500m CM. Underwriters approved. *Write for catalog.*

H. B. SHERMAN MFG. CO.
BATTLE CREEK, MICH.

Sherman SOLDERLESS LUGS

SAVE VITAL MATERIALS WITH TRICO RENEWABLE FUSES

Switch "One-Time" fuse users to TRICO "Powder-Packed" RENEWABLE FUSES.

Only the renewal element—NOT THE COMPLETE FUSE—is replaced.

No critical materials are scrapped—Manpower and Transportation are saved—Fuses can be renewed right on the job—Customers get THREE TIMES THE SERVICE—You make more money and get the repeat business.

Strict "THRU THE JOBBER" policy protects your profits.

FOR PRESTIGE—FOR PROFIT SELL TRICO

TRICO FUSE MFG. CO., Milwaukee, Wis.
In Canada: IRVING SMITH LIMITED, Montreal

with the company's merchandise department at Bridgeport in 1932, he went with it as manager and chairman of the management committee. Two years later he was appointed assistant manager of appliance sales, and in 1935 became manager of the radio division. A year later he was promoted to assistant manager of the appliance and merchandise department, and in January 1938 succeeded Charles E. Wilson as manager of the department.

Mr. Cordiner's office will be in New York City.

B. H. Sullivan Leaves Westinghouse Lamp

Mr. B. H. Sullivan, general sales manager of the Westinghouse Lamp Division of the Westinghouse Electric and Manufacturing Company, has announced his resignation.

Mr. Sullivan had been with that division for more than 20 years. He had been successively district sales manager for the St. Louis and Chicago lamp divisions before his appointment as general sales manager in charge of all the Westinghouse Lamp operations.

Changes Address

The Electric Equipment Company of Rochester, N. Y. has announced that it is moving on September 15 to its new warehouse location at 63 Curlew St., that city.

OBITUARIES

C. M. Snyder

Carl M. Snyder, assistant manager of the Appliance and Merchandise Department of the General Electric Company at Bridgeport, Conn., died recently in New Haven following a long illness.

Mr. Snyder was generally recognized as the father of the electric kitchen trend. He was also a pioneer in the ensemble selling of equipment for electrified homes.

He was a graduate of the Syracuse University School of Architecture, and for several years after the last war, in which he served abroad, he practiced achitecture in Syracuse.

His interest in the design of devices which would eliminate discomfort or drudgery in the homes he was designing, finally led him to join the Walker Dishwasher Company. In 1930 that company was purchased by the General Electric Company and Mr. Snyder went with it. While working for GE he developed further his ideas on the complete kitchen and later on, the complete electrified home.

NEW Revere

9-S-5452 NAVY STANDARD
BUILT TO NAVY SPECIFICATIONS

500 WATT

Rugged design to withstand concussion and vibration.

•

Weather-proof, Sure-tight hinged door.

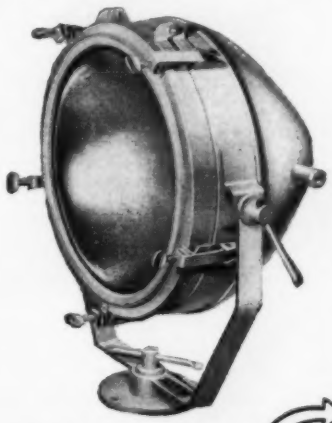
•

Highly efficient — requiring minimum of maintenance

•

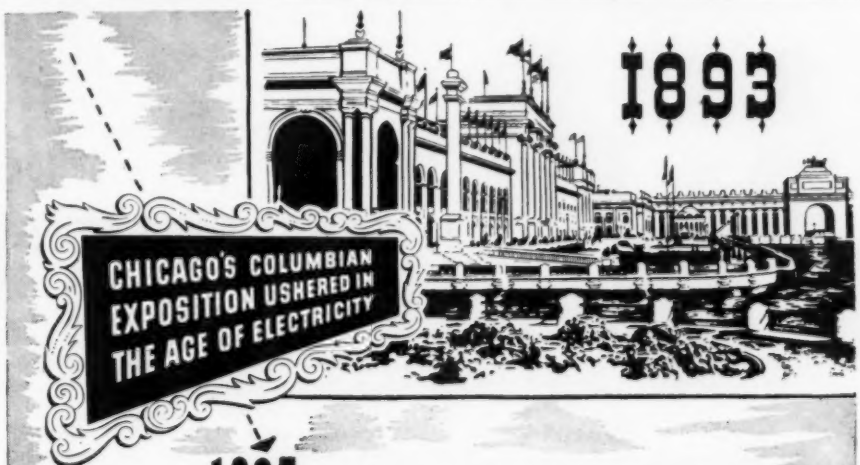
Ideal for any location where controlled light sources are needed.

Write for full particulars.



FLOODLIGHTS and SEARCHLIGHTS for EVERY PURPOSE

REVERE ELECTRIC MFG. CO.
2935 NORTH PAULINA STREET · CHICAGO
Originators of the Hinged Floodlight Pole
INDOOR and OUTDOOR LIGHTING EQUIPMENT of EVERY DESCRIPTION



in . . . 1895, just two years later, Thordarson ushered in the age of transformer specialization

Consistently since that date . . . year in and year out, Thordarson engineers have always been a step ahead in developing the newest and most needed types of transformers. Today, in practically every country on the face of the earth, Thordarson leadership is an established fact, proven by the manifold tasks which transformers bearing the trade-mark "Thordarson" are successfully performing on the war fronts of the world.

ARMY E NAVY
THORDARSON
ELECTRIC MFG. COMPANY
500 W. HURON ST., CHICAGO, ILL.

Transformer Specialists Since 1895
ORIGINATORS OF TRU-FIDELITY AMPLIFIERS

P&S DESPARD

Inter-changeability

The interchangeable features of the P&S-Despard Line mean more than ever in these days of limited stocks.

Just the thing for that next job —T-rated switches, double-grip outlets, pilots and accessories.

Keep your P&S catalog handy —Send for a new one if yours is out of date.

PASS & SEYMOUR, INC.
SYRACUSE, N.Y.

MORE FACTS ON PRODUCTS

Control Equipment—New 4-page illustrated booklet B3256 on Mot-O-Trol, an electronic adjustable speed drive, manufactured by the Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., tells how it works, lists its advantages, and includes charts showing motor speed characteristics.

When writing mention WHOLESALER'S SALESMAN

Distribution Systems—The Frank Adam Electric Company of St. Louis, Missouri, announces publication of Bulletin No. 65 which describes its war model Busduct distribution system for light and power—the feeder Busduct, plugin Busduct and accessories.

When writing mention WHOLESALER'S SALESMAN

Fluorescent Lighting Unit—The Mitchell Mfg. Co. of Chicago, Illinois, announces the company's bulletin No. 275 that describes the portable fluorescent lighting unit, model No. 2060, designed for modern lighting of production, assembly and inspection lines. Also may be used over benches, machines and tables.

When writing mention WHOLESALER'S SALESMAN

Knob and Tube Wiring Chart—A newly revised chart for knob and tube wiring that will meet the 1940 National Electrical Code and Revisions is now ready for distribution, illustrates how porcelain and other non-critical materials may be used, and is published by James Steel Mahan, 201 North Wells Street, Chicago, Illinois.

When writing mention WHOLESALER'S SALESMAN

Manual Starting Switches—A new combination bulletin and price sheet describing the Allen-Bradley line, of Bulletin, No. 600, manual starting switches for motors rated up to 1 hp, 110-220 volts, a.c. and ¾ hp, 115-230 volts, d.c., has just been published by Allen-Bradley Co., Milwaukee, Wisconsin.

When writing mention WHOLESALER'S SALESMAN

How to save time by doing more reading

That is a profitable paradox for you. More true today than perhaps ever before. For here in the pages of this publication are packed many helpful ideas . . . considerable useful information. Much of it, in fact, available from no other source.

And we most emphatically mean *both* the editorial and the advertising pages.

Just one new idea gleaned from these pages . . . a method for doing something better or faster or easier or at lower cost, may alone save you far more than a year's reading-hours invested in this and other worthwhile business papers.

Many people have found this a fact . . . not only once, but time and time again. That's significant . . . with time so precious today.

★

Good advertising speeds information from those who have it . . . to those who need it.

★

McGraw-Hill Publishing Company, Inc.

330 West 42nd Street
New York 18, N. Y.

"FRIGID"
VENTILATING EQUIPMENT
Circulators, Exhaust Fans, Blowers, Attic and Industrial Fans, Spray Booth Fans, Shutters
FOR THE DURATION WE CAN ACCEPT PRIORITY ORDERS ONLY
Circulators and Devices Manufacturing Corp.
100 Prince St. New York, N. Y.

ACF *"A Quality Line at Competitive Prices"*
A full line of quality conduit fittings and connectors. To assure your contractor and industrial customers of full satisfaction, sell them the A.C.F. line.
Illustrated is a ⅜" Non-Metallic Sheathed Cable Connector.

Write for descriptive bulletins and prices.
ATLANTIC CONDUIT FITTINGS CO.
589 Atlantic Avenue • Boston, Mass.

TORK

TURN ANYTHING ELECTRICAL ON & OFF REGULARLY
The **TORK CLOCK CO., Inc.**
MOUNT VERNON, NEW YORK

NALCO

Infra-Red Ray
LAMPS
For Radiant Energy —Baking And Drying
Meet industry's demands for radiant energy-heating and drying by featuring Nalco Dritherm Carbon Filament Lamps. Available in Inside-Silvered finish (no reflectors required) or in Clear Glass style.
Write for prices and discounts
NORTH AMERICAN ELECTRIC LAMP COMPANY
1034 Tyler Street St. Louis, Missouri

Motors—Sixteen-page booklet published by the Century Electric Co. of St. Louis, Mo., describes and illustrates the company's squirrel cage induction polyphase motors.

When writing mention WHOLESALER'S SALESMAN

Socket Wrenches—Twelve-page booklet has recently been prepared by the Blackhawk Mfg. Co., Milwaukee, Wisconsin, called "Meet the Mechlins." This booklet presents helpful suggestions for buyers and users of socket wrenches.

When writing mention WHOLESALER'S SALESMAN

Switches—The Acro Electric Company of Cleveland, Ohio, has available a 10-page bulletin illustrating and describing its line of Acro-Snap switches.

When writing mention WHOLESALER'S SALESMAN

Torquing Tool—The Tubing Seal-Cap, Inc., Los Angeles, Calif., has recently published a folder that describes the Livermont Torq-Snap wrench and illustrates with photographs its various industrial applications.

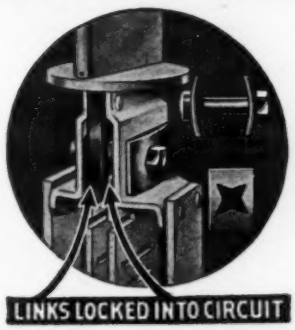
E.E.I. Surveying Appliance Parts

A nation-wide survey on the electrical appliance repair parts situation is being made by the Edison Electric Institute, according to C. E. Greenwood, commercial director, in order to help the War Production Board in its efforts to determine the supply of essential material for adequate appliance maintenance.

To Develop Electronic Tubes

The formation of a new company to be called the Detroit Electronic Laboratory, with headquarters at 10345 Linwood Ave., Detroit, has been announced. The organization will concentrate on the development and manufacture of special purpose electronic tubes as well as institute a "Victory Repair Service" for ignitron tubes.

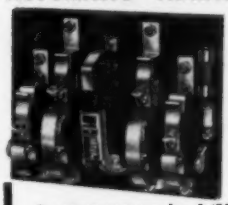
John D. Gordon, formerly general manager of the Taylor-Winfield Corporation, will direct the new company as general manager.

WARE HI-LAG


NON-HEATING CONTACTS
Keep Motors Humming
- End Over-Heating
- Stop needless fuse blowing
- Time-Lag 2 to 5 Times Normal Current
- Certified to Comply—Federal Specification W F 803-a-Type II

APPROVED BY UNDERWRITERS
Mfgr's. Agents Territory Open
WARE BROTHERS
4420 W. Lake St. Chicago, Ill.
WARE
Renewable
HI-LAG FUSES

Electrical Wholesalers
INDUSTRY NEEDS
ZENITH
AUTOMATIC TRANSFER SWITCHES



Lighting must be continuous in war plants—hospitals—public buildings—scores of today's centers. New equipment is required. Replacements called for. ZENITH transfers from normal to emergency in 1/25 second! Always dependable.
Electrically held (also mechanically held). AC to AC, AC to DC, any combination. 1, 2, 3, 4 poles. 18 capacities, 30 to 200 amps.

Get
ZENITH
Catalog of full line. Switches, Contactors, Process Timers, Etc. Write or write

ZENITH
ELECTRIC COMPANY
160 West Walton St. Chicago 10, Ill.

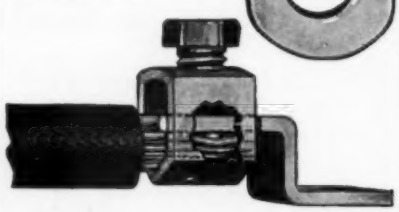
ILSCO
Electrical Connectors

APPROVED
by all authorities
by all users everywhere

Efficiency . . . dependability . . . economy . . .

ILSCO PRODUCTS give you *everything.*

ELECTRICAL CONNECTOR FABRICATED TUBE PARTS
Seamless copper tubing is drawn down to size in our own plant.



MAIL THIS COUPON TODAY

Please send us sample of .....
and catalog.

Name .....
Firm Name .....
Address .....

ILSCO COPPER TUBE & PRODUCTS, Inc.
CINCINNATI, OHIO

ADVERTISERS' INDEX

A

Adam Electric Co., Frank..... 13
American Blower Corp..... 8
Appleton Electric Co..... 23
Arrow-Hart & Hegeman Elec. Co.... 10
Atlantic Conduit Fittings Co..... 129

B

Briegel Method Tool Co..... 124
Bull Dog Elec. Prod., Inc., Inside Front Cover
Bussmann Mfg. Co.....Back Cover

C

Champion Lamp Works..... 29
Circulators & Devices Mfg. Co..... 129
Conduit Pipe Products Co..... 14
Corning Glass Works..... 24
Crescent Ins. Wire & Cable Co..... 17
Crouse-Hinds Company 31
Curtis Lighting, Inc.....84, 85

D

Day Brite Lighting, Inc..... 25

E

Edwards & Co..... 3
Electrical Testing Laboratories Inc... 78
Electro Mfg. Co..... 83
Emerson Elec. Mfg. Co..... 26

F

Fleur-O-Lier Mfrs. 75, 76, 77
Frink Corp. 79
Fullman Mfg. Co..... 123

G

General Electric Co. (Bridgeport) .. 82
General Electric Co. (Nela Park) 69, 70, 71
General Electric Co. (Schenectady).. 90
Goodrich Elec. Co..... 118
Guth Co., Edwin F..... 16

H

Hazard Ins. Wire Works Div..... 38
Hexacon Electric Co.....126

I

Illinois Electric Porcelain Co..... 119
Ilsco Copper Tube & Products, Inc... 130

J

Jefferson Elec. Co.....18, 87

K

Ken-Rad Tube & Lamp Corp..... 62
Klein & Sons, Mathias..... 122

L

Leader Elec. Mfg. Co..... 88
Light Control Company..... 89
Lloyd Products Company..... 80

M

Minerallac Electric Co..... 125
Mitchell Mfg. Co..... 81

N

North American Lamp Co..... 129

O

Okonite Company 38

P

Pass & Seymour, Inc..... 128
Plymouth Rubber Co..Inside Back Cover
Porcelain Products, Inc.....120

Q

Quadrangle Mfg. Co.....116

R

Revere Elec. Mfg. Co..... 127
RLM Standards Inst., Inc..... 30
Royal Electric Co..... 124

S

Save Electric Co..... 27
Schwarze Electric Co..... 12
Sherman Mfg. Co., H. B..... 126
Smith Iron Co., A. L..... 86
Solar Lighting Co..... 94
Spero Electric Corp..... 91
Square D Company..... 6
Steber Mfg. Corp..... 121
Sylvania Elec. Prod., Inc.....35, 36, 37

T

Talk-A-Phone Mfg. Co..... 125
Thomas & Betts Co..... 33
Thordarson Elec. Mfg. Co..... 127
Tork Clock Co..... 129
Trico Fuse Mfg. Co..... 126
Tru-Ad Company, The.....92, 93

U

U. C. Lite Mfg. Co..... 28
Union Insulating Co.....123
United States Rubber Co.....9, 20, 21
U. S. Treasury Dept..... 95

W

Wakefield Brass Co., F. W..... 5
Ware Brothers 129
Westinghouse Lamp Co.....4, 3
Williams Products Co., H. E..... 93
Wiremold Co. 5
Wolverine Tube Division..... 11

Z

Zenith Electric Co..... 130